# THE AMERICAN GAS LIGHT JOURNAL

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME XLVIII.—No. 8. Whole No. 692. | NEW YORK, MONDAY, APRIL 16, 1888 | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y. AS SECOND CLASS MATTER.

**Published** on the 2d and 16th of each month, at No. 42 Pine Street, N. Y.

**Terms of Subscription, Including Postage.**—For the United States and Canada, $3 per annum. European countries, $3.50 (15 shillings—18 francs). All payments to be made in advance. Single copies, 15 cents.

**Remittances** should be made either by post-office order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.


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[OFFICIAL NOTICE.]

### Eleventh Annual Meeting of the Western Gas Association.

SECRETARY'S OFFICE, WESTERN GAS ASSOCIATION,
QUINCY, ILL., April 11, 1888.

The Eleventh Annual Meeting of the Western Gas Association will be held at Chicago, Ill., on the 9th, 10th and 11th days of May.

The Grand Pacific has been chosen for our headquarters, and the finest hall ever placed at our disposal, in the immediate vicinity of the hotel, will be used for the business sessions of the Association. Hotel rates to members will be $3 per day, with baths, and rooms on the parlor floor, extra. It will be well for our members to secure their rooms in advance, which can be done by writing to the proprietor of the hotel and accompanying their request with a statement of the kind and price of rooms desired.

The titles of the papers which will be presented at our forthcoming meeting, together with the names of the authors, are as follows:

"Fuel Gas," by Walton Clark; "Half-Depth Regenerative Furnaces," by Frank Bierce; "Inclined Retorts," by Henry Pratt; "Gas Company Accounts," by J. D. Thompson; "The Cost of Electric (Arc) Lighting," by C. M. Keller; "The Maximum Service that Should be Required for the Various Standard Sizes of Meters," by Wm. McDonald; "Purification in Closed Vessels," by Frederic Egner; "Incandescent Gas Burners," by Edward Lindsley; "A Paradoxical Box," by B. E. Chollar; "Observations; Gaseous and Otherwise," by Geo. Shepard Page.

During the second day of our Convention Prof. T. C. Mendenhall, President of the Rose Polytechnic Institute, Terre Haute, Ind., will favor us with a lecture on the subject of "Photometric Standards and Processes."

The Local Committee of Arrangements has been enlarged, the names of Fred. R. Persons and John Stout having been added thereto.

Blank forms of application will be forwarded to those who will inform the Secretary of their desire to become members of our Association.

A. W. LITTLETON, Secy.

### OBITUARY.—MAJOR T. F. WHITE.

In our number for Feb. 2 it was our pleasant task, in reporting the doings of the shareholders of the Houston (Texas) Gas Light Company, at their last annual meeting, to say that Major T. F. White was, despite his advanced years, apparently as active and energetic as ever. That the shareholders held a similar opinion was shown from the unanimity with which they re-elected him to his triple position of Secretary, Treasurer and Superintendent. In common with others of his friends, we were greatly shocked on recently hearing that he has passed over to the majority, his death having occurred on Feb. 28, after an illness of but twelve days. Feeling that the fraternity would appreciate some account of the life of a man who, although unknown personally, perhaps, to the greatest bulk of their number, was a credit to his profession and his fellows, we are now enabled, through the courtesy of his successor at Houston—Mr. G. R. Vaughan—to lay before our readers the following particulars.

Deceased was born in Massachusetts in an early year of the present century—possibly in 1808 or 9—but his most intimate friends are unable to locate either the town or fix on the precise date. When still of very immature age his parents removed to South Carolina, in which State he received his early training, and where he imbibed ideas that eventually inclined him towards a military career. His parents favoring the inclination, he subsequently passed with credit through the West Point ordeal, and became regularly attached to the United States army service. In those days it required the services of a bright and energetic officer to keep in check the mongrel hordes who infested the trading forts on the far frontiers; and his capacity and fearlessness, although often and sorely tested, were never found wanting. If the records of the old posts most noted for their turbulency could be examined many a page would testify

to the brilliant services of the subject of this necessarily imperfect sketch. It will easily be understood that men of no common mould were necessary to check the outlaws who roamed through New Mexico, Arizona and Colorado in the fifties. During the civil war the deceased, then well advanced in years, was attached to the Quartermaster's Department; and when the country was once more reunited Major White settled in Texas, becoming engaged in the cotton trade at Galveston. In 1872 he was invited by the proprietors of the Houston Gas Light Company to assume the office of Secretary and Treasurer in that enterprise. Although the outlook was anything but inviting, he finally assented to the proposition, and entered upon his new career. In due time the Company was placed on a firm footing, and to-day it is one of the most prosperous undertakings in the great Lone Star State—a consummation directly traceable to Major White's energy and perseverance. Deceased was elected to membership in the American Gas Light Association, at its Fourth Annual meeting, held at Chickering Hall, this city, October, 1876, and although not particularly prominent in its records, he was a firm believer in the Association's influence for good on our industry

Patient, brave and worthy, the simple story of his life bears testimony to his faithfulness as a soldier, and his trustworthiness as a civilian.

## BRIEFLY TOLD.

A Word about the Syracuse (N. Y.) Gas Light Company.—The enterprising proprietors of the Syracuse *Herald* have published a very handsome "Trade Edition" of their newspaper—in fact, we think it could properly be called a magazine—which is devoted to an exposition of the industries with which that handsome city abounds. Of course, such a description would be manifestly incomplete did it not include an extended reference to the establishment which for almost two score of years has ministered to the artificial lighting needs of the residents.

For the greater part of the details which follow we are indebted to the *Herald's* "Trade Edition," which informs us that the Company was incorporated, in February, 1849, by Messrs. Moses B. Burnet, Harvey Rhoades, W. H. Alexander, Hamilton White, Thos. D. Fitch, Jos. F. Sabine, Allen Munroe and P. W. Fobes. Its first President was M. D. Burnet, Mr. J. F. Sabine being the first Secretary. The present Directory consists of Messrs. A. A. Howlett, P. W. Fobes, G. F. Comstock, Jas. J. Belden, D. P. Wood, Chas. Andrews, Frank Hiscock, B. S. Aldrich, G. N. Kennedy, Thos. Maloy, and A. C. Wood. The chief officer is Mr. A. A. Howlett, who succeeded the late Gen. Leavenworth, on the death of the latter, in November, 1887. The Secretary is Mr. H. M. Babcock; and it seems almost superfluous to say that Mr. Austin C. Wood is its Superintendent.

The Company originally started with a main system about 12 miles in extent, which has since been increased to 55 miles, the conduits now reaching out to Geddes on the west; to Danforth on the south; on the north to the outer line of what was known as old Salina; the extension on the eastern boundary not having progressed so rapidly as on the other points, although here we find that an appreciable allowance has been made. It is quite an undertaking to lay down and keep in repair cast iron pipes under certain sections of the city, for water of a decidedly brackish nature is freely encountered at a depth of perhaps 2 feet. However, the Syracuse gas men manage to keep their lines in pretty good condition, as is shown by the average annual return in respect to unaccounted-for gas. The Company's original capital was $75,000, which has been increased at times (presumably in 1864, 1870, 1883, and 1887, for in each of those years large additions to plant were made), until now it figures at $500,000. Unlike the hydraulic pressure which occasionally causes trouble to the main pipes, the capital stock of the Syracuse Company knows not what water is! We do not feel called upon, because frequent timely mention has appeared in our columns in reference thereto, to say anything here about the high state of efficiency at which the plant is kept by Supt. Wood. Everything about the place is as it should be; which is saying much for the skill of its managers and the liberality of its proprietors. Still, liberality of the right sort is the safest road to profit for all time.

On starting, the Company charged $4 per thousand for gas, but in time increased business and progressive management brought the rate down to the figure of $2.75, where it stood just prior to the war of the rebellion. In these troublesome times, owing to the greatly enhanced cost of labor and materials—the Syracuse folks in the "sixties" paid as high as $140 a ton for cast iron pipe, while $15 to $18 per ton was a common price for caking coal—gas reached a maximum rate of $4.80. With a return to peace the reduction process once more set in; and now Syracusans obtain a good 20-candle gas at $1.50 per thousand, with every prospect that soon they will be still more cheaply served. In concluding this condensed sketch of a live Company, it is with pleasure that we reproduce the *Herald* man's opinion of Supt. Wood, which, we may add, quite agrees with our own:

"To how great an extent the business success of the Company, and the satisfaction given to the public are due to the efforts of Mr. Wood none will ever know. Mr. Wood is one of the most expert and accomplished gas engineers in the country, and his information, experience and sound judgment have been invaluable to his employers."

Annual Meeting of the Montreal Gas Company.—When, on the afternoon of the 6th inst., President Jesse Joseph called the stockholders (who had assembled in great force) to order for the purpose of hearing how their interests had been managed during the twelvemonth, the rather sunny appearance of their faces betokened that inward satisfaction which is presumed to precede the immediate approach of a time for feasting. The facts (or plums) contained in the annual reports must have been noised—according to the "fact" or "plum" acceptation—around in advance; because, while the sunny appearance undoubtedly broadened during Secretary Scriver's recital, no unseemly agitation marked the reception of the official declaration. Of course, it is an easy matter to accept a semi-annual dividend of 6 per cent.; hence the placidity of the Montreal Company's shareholders.

The Company's business for the past year shows a most satisfactory increase both in the number of new consumers added, and in the larger quantities of gas used by consumers previously on its lists. The latter increase is largely to be accounted for by the extended use of gas for domestic and manufacturing purposes. Better prices were also obtained than in 1886–7 for coke and tar. The bond issue, recommended by the officers and approved by the shareholders at a former meeting, was satisfactorily arranged for. The bonds (bearing 4½ per cent. interest, the issue being, in round numbers, equivalent to $250,000) were taken by London parties at the rate of 97½. The moneys thus taken in were to be devoted to plant enlargement, and the sum so far spent in this direction amounts to $144,000.

The new gasholder at the Elm station will be put in duty next month, the preliminary test of its availability having proved satisfactory. A new retort house (64 ft. by 220 ft.) calculated to shelter 288 retorts, with a total manufacturing capacity of 2½ millions cu. ft. per day, is now in process of construction. Improved furnaces are to be employed. A two-million washer-scrubber of the "Eclipse" type has been bargained for, and the apparatus will be installed early in the summer. Upwards of 7 miles of mains were buried—maximum diameter, 20 inches; minimum, 4 inches. The report contains many other interesting details, but sufficient evidence of the Company's prosperity is contained in the matter given above.

The retiring Directors, Messrs. Hugh McLennan, John Ostell, Alexander Urquhart, and the Hon. L. R. Masson, were chosen to succeed themselves. The full Board subsequently re-elected Mr. Joseph to the Presidency. The recommendation that no change be made in the time of dividend payments—some time ago it was urged that these should be paid quarterly instead of semi-annually—was agreed to, whereupon the meeting adjourned.

An Addition to Our Gallery.—We are indebted to Mr. Jas. R. Floyd for a handsomely-framed photograph of the set of purifiers (24 ft. by 24 ft. by 3 ft. 1 in.) erected by him at the 44th street station of the Consolidated Gas Light Company. These purifiers, which are equipped with the Nock and Floyd Patent Hydraulic Hoisting Carriage, will be apt to convince the most skeptical that the constructors of gas works apparatus in this neighborhood have lost none of their reputation for ability and cleverness in their business. Gas men from out-of-town when visiting New York will certainly be repaid for any trouble they may be put to in visiting the 44th street station in order to have a look at the boxes.

Odd Lots.—The favor with which Mr. C. L. Levey's "Electric Light Primer" was received has encouraged the author to place a second edition of the book on the market. The newer specimen contains quite a goodly addition to the facts and figures presented in his initial compilation, but the price—50 cents—remains unchanged.——Mr. Z. M. Jenks, of the Woonsocket (R. I.) Gas Company, was chosen, during the election just held, to represent his assembly district in the next session of the Rhode Island Legislature. Being a clever gas man, he is likely to make a good legislator. We congratulate the Woonsocket voters on the wisdom of their action.——The Concord (N. H.) Gas Light Company has arranged for the erection of its new gasholder. Messrs. Deily & Fowler will put up the iron work, and Mr. W. C. Whyte, of this city, will build the tank. The vessel is to have a capacity of 120,000 cubic feet.

## The Improved Pentane Lamp.

It will be remembered that in the report,* submitted last March to the New England Association by the special committee (Messrs. Taber and Prichard) on "Candle Power and Illumination," copious reference was made to the Harcourt pentane standard, and that a sample of the same was also exhibited. It may therefore interest many of our readers to know that Mr. Harcourt has been engaged in still further perfecting his pentane apparatus, the details of which advance are contained in the appended article from a recent issue of the *London Journal*. Our authority says:

We have recently had occasion to draw attention to the pentane standard lamp devised by Mr. A. Vernon Harcourt, and made by the Woodhouse & Rawson Electric Manufacturing Company, Limited. The excellent work done by this lamp has been shown by Mr. W. J. Dibdin, F.I.C., F.C.S., the Chemist and Chief Gas Examiner of the Metropolitan Board of Works, in his report to the Board on "Standards of Light," in which the lamp stood at the head of all the standards tested, and yielded the exceedingly good average of 97 per cent. of tests within 1 per cent. of the mean value—a result, we believe, never before reached by any standard tested under similar conditions. We understand that Mr. Harcourt's aim in devising this lamp was to produce a portable and self-contained instrument, dispensing with some of the more bulky apparatus employed in his well-known pentane standard.

Notwithstanding the excellent results attained by the lamp, Mr. Harcourt believed he could construct one on a somewhat different principle which would be equally exact and more easily managed. This new lamp has been put into the hands of the makers of the former lamps; and a rough sketch of it is appended. This lamp, instead of being fed with a mixture of air and pentane, consumes pentane vapor only; and, though unprovided with any glass chimney round the flame, burns steadily even when exposed to moderate draughts. At the same time the important condition that the color of the flame, produced by the direct combustion of the rich pentane vapor, should be as white as possible, is insured.

It will be seen from the sketch that the lamp takes a form somewhat similar to an ordinary spirit-lamp, with an additional metal chimney above. This chimney, by producing a strong upward draught, serves a twofold purpose: (1) the flame is kept exceedingly steady; and (2) the temperature of combustion is raised, and a whiter light produced. A wick is employed, which would be a distinct disadvantage were it used as wicks generally are, within the flame, or close to the point of combustion of the vapor; but in this case the wick remains at a distance of 2 or 3 inches from the point of ignition, and serves only to convey the liquid pentane by capillary action to a part of the tube in which it is volatilized by the warmth conducted downward from the flame. The wick, it will be observed, is inclosed in a tube, in which it fits comfortably, and which is open at the upper and lower ends. This tube is jacketed by a larger tube, to which it is attached by flat plates. This jacketing serves to produce a steady temperature of the liquid and vapor contained within it—the vapor burning as it is produced at the upper extremity of the tube. These two tubes are further jacketed by another larger one, the upper portion of which is contracted into a smaller tube, which is of the same size as the lower portion of the chimney. This chimney is itself enlarged in its upper portion, and is attached by two metal bands to the exterior of the larger part of the lower tube. The bands are so shaped as to be at some distance from the flame; and, by means of slots cut in their lower portion, the chimney of the lamp can be moved up and down within the necessary limits. The lower tube is removable, and is attached to a gallery (solidly fastened to the base of the lamp) by a bayonet joint.

The action of the lamp is as follows: On removing the lower tube and warming the inner tubes, the pentane vapor rises from the opening in the small tube, and can there be lighted. On putting on again the large tube with the chimney attached, the flame rises above the top of the edge of the lower tube; and by slightly raising the wick, the top of it passes into the chimney. In this chimney two narrow slots, 10mm. high, are cut diametrically opposite to each other, so that the tip of the flame may be seen through either of them. When the movable chimney is set at a definite height above the upper edge of the lower tube, and the flame is raised so that the tip is seen to be somewhere between the upper and lower limits of the slots, the central portion of the flame appearing between the upper edge of the lower tube and the lower edge of the chimney gives a definite quantity of light.

It is well known that the light emitted from the center of the flame is little affected by considerable variations in the height of the flame. With the flame of this lamp Mr. Harcourt has ascertained experimentally what part is of the most constant brightness, and what variation in the height of the flame may be made without measurably affecting the brightness of this portion. The actual position of the interval between the lower tube and the chimney and the length of the slot opposite to any part of which the tip of the flame may be, are the outcome of these experiments. Mr. Harcourt has found—and his results have been confirmed by subsequent experiments at the makers' factory—what portions of the flame must be selected to give a light of 1, 1½, or ½ a candle, as may be preferred. Of course, any intermediate values can also be obtained by setting the chimney at various heights above the lower tube, and thus altering the amount of light visible between the upper and lower tubes.

The method for accurately setting the height of the chimney is both ingenious and simple, and forms one of the most attractive features of the lamp. Small gauges of accurate height, and exactly fitting the outside diameter of the upper and lower tubes, are inserted between them. The chimney is lowered until it rests firmly and securely upon the gauge. It is then screwed tightly to the lower cylinder by means of set-screws, and the gauge is withdrawn horizontally, leaving, of course, a distance between the two tubes exactly equal to its height. In the case of the gauge requsite to obtain ½ candle, it is found necessary to add a small collar upon the smaller tube, so as to insure a portion of the flame being used which will remain perfectly constant, even should the height of the flame vary within the prescribed limits. This variation of the height of the flame is found to be exceedingly small after the lamp has been alight for 10 or 15 minutes, and the inner tube has reached a steady temperature, the constancy of which is greatly increased by the method of double jacketing employed.

In order to make the instrument thoroughly accurate as well as convenient, the inventor has added a base with leveling-screws, and a simple and efficient method of leveling the lamp; and in addition to this he has provided a small piece of glass suitably fixed to reflect the upper portion of the flame visible through the slots, so that its position with regard to the slots may be verified at any time by an observer toward whom the face of the lamp is turned. The color of the light is such as to make photometry of ordinary gas lights exceedingly easy; in fact, it is nearly the same as that of the pentane flame. The lamp has been well tested in exposed positions, and has stood the tests remarkably well—the flame resembling a luminous pencil more nearly than an ordinary flame.

Mr. Harcourt pointed out before the Physical Section of the British Association that, owing to the employment of an upper and lower cut-off, it is impossible to measure distances from any portion of the flame

*Ante, p. 171.

or any point in front of it; so that the law of variation of light according to the inverse square of the distance should exactly hold. But he stated that if distances are measured from a point midway between the axis of the flame and the face of the cut-off, the errors from this cause are perfectly negligible at all distances of not less than 10 inches; and he has insured this point being easily found by making the metal bands, which unite the chimney and lower tube, of half the width of the cut-off tube, and by cutting in these bands two slots, into which a metal plate may be slipped. The lamp can thus be brought into its true position either by setting the edges of the bands, when the lamp is at the right height, between two plumb-lines lying in a plane perpendicular to the photometer bar and passing through its zero, or by direct measurement from the face of the metal plate.

The work thus done by Mr. Harcourt toward the production of a thoroughly reliable standard of light, and the success which has attended his previous efforts, are sufficient guarantee that the new form of lamp will not only prove a thoroughly reliable instrument, but will be found not less accurate than the previous forms invented by him; while the practical experience of the makers will insure the lamp being so constructed as to bear successfully the test of every-day work.

## ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

At the last annual meeting of the Board of Trustees of the Boston Public Library, Mr. W. W. Greenough declined a re-election to the Presidency of that Trust. It is hardly necessary to say that his long stewardship in this position was characterized by efficiency, energy and fidelity; and his co-adjutors, together with the citizens of his city, while sincerely regretting his determination to withdraw from active duty in this connection, admit the force of his reasons for declining longer to serve in the capacity named. His moral support and willingly-offered counsel they can always command.

Some time ago a "dynamiter" from Findlay, Ohio, reached Richmond, Ind., on his way to Hagerstown to "shoot" a gas well. The city of the Starrs' was reached when "the shades of night were falling fast," and the aforesaid exploder confessed his determination of stopping in Richmond over night, the load of combustibles also to remain over. This idea did not take with the authorities, who ordered him to move on; and he went—cartridges, and all.

The New Brunswick (N. J.) Gas Company offers to maintain the gas lamps in that city, provided a three-year contract is made, on the basis of $13.62 each per annum, a moontable to be followed. The Edison Company offered to supply 2000-candle power arcs for $100 each. Even admitting that one arc would displace 6 gas lamps, the relative cost to light would be $81.72 per annum for gas, as against each $100 expended for arcs.

Cheaper Gas for Mansfield, Ohio.—Although Vice-President Bird, of the Mansfield Gas and Electric Light Company—in the course of the debate, between Messrs. Gwynn and Denniston, at Sandusky, relative to the advisability of gas companies operating electric lighting plants—seemed to fear that his Company might eventually have to buy out another set of electric speculators who proposed to enter the local lighting field, that premonition does not appear to rest on him very heavily. We judge so from the receipt of a letter from Supt. Harris, who says therein that, beginning with the first inst., the Mansfield Company has agreed to sell gas at the net rate of $1.60 per M—gross, $1.80, with 20 cents off for payment within 15 days from presentation of accounts. The old rate was $2 gross. The Company also makes a special rate on all gas consumed for other than illuminating purposes. In the announcement to the consumers we also note a line to the effect that the Company agrees to sell gas stoves at considerably lower prices than those of a year or two ago. For instance, a two-burner stove is rated at $9, while a three-burner one is to cost $10.50. A further hint is offered to the effect that the Company can also furnish gas burners, designed to fit gasoline stoves, at small cost. We have an idea this will cause many a Mansfield matron to "look in at 11½ North Main street," just to see if a good stove can be made out of a bad one.

Electric Light at Troy, N. Y.—At a meeting of the Troy Contracting Board, held April 3, the Messrs. Powers, who are the Troy Electric Company, indulged in a most doleful whine at a proposition made on behalf of the city whereby the latter offered to give them $150 per annum for maintaining each 2000-candle power arc ordered. The Powers, who are nominal in the matter of candles, but actual as to prices, told how they sunk $8,000 to $10,000 in the first year after they took hold of the plant, "but were not discouraged because they believed the city would pay what was a fair price after it had been demonstrated that the enterprise was a success," etc. Their original bid this year was 50 cents; last year they were paid 47 cents. It is not to be wondered at, therefore, that the $150 (about 41 cents per night) proposition was unpalatable. When they withdrew from the Board room an "informal recess" was taken, at the conclusion of which Mayor Whelan summoned the Powers family—who were within easy reaching, like the cut-and dried nominee who is to be waited on by a committee appointed to inform him of the unanimous determination of the convention to put him before the country as the people's choice—and informed them that the Contracting Board had agreed to sign a contract on the basis of 43½ cents per light per night—262 arcs to be maintained. Mr. Powers, Sr., thereupon said, "The Company was compelled to accept the offer, although it was not a fair price for the service." No action was taken by the Board on the subject of lighting with gas the public buildings and the streets in sections of the city not reached by the Powers.

Another Powers—a Poughkeepsie, N. Y., Councilman is the latter—introduced a resolution before the Poughkeepsie City Fathers, on April 3d, which indorses an act, to be presented to the State Legislature, empowering Poughkeepsie to establish and maintain its own electric plant. The act limits the expenditure to $50,000. Mr. Bayley thought, as one member who would have espoused the negative side of the question was absent, that Mr. Powers' motion ought to be tabled, and Mr. Spalding inclined to the view that the table disposition would be improper, inasmuch as the taxpayers—how fond Councils along the line of the Hudson river seem to be of taxpayers' rights—ought to be convened in special election on the subject. Bayley and Spalding were defeated, whereupon the Powers' act was indorsed.

The Stacey Manufacturing Company is under contract to erect treble-lift holders at Milwaukee, Wis., and San Francisco, Cal., respectively.

Secretary Decker informs us that the Eighth Annual Meeting of the American Water Works Association will begin to-morrow in "The Hollenden" House, Cleveland, Ohio. The sessions will terminate on Thursday afternoon. The programme calls for the presentation of no less than 16 papers, each (judging from the titles) on a subject of interest and importance to hydraulic engineers. We herewith thank Bro. Decker for an invitation to be present at the gathering, which cannot prove to be other than successful.

Mr. Lloyd, Superintendent of the gas works now in process of construction at Riverside, Cal., expects to have gas making underway by the first of next month. The benchwork and holder are completed, and the main pipes are being rapidly placed. The capacity of the plant is rated at 20,000 cubic feet per diem. The gas rate has been fixed at $4 per thousand.

Kingston (N. Y.) is agitating the subject of electric street lighting, and with some prospect of finally adopting it. Mayor Newkirk, in a recent message to the City Council, mentioned the likelihood of such a step being taken, and thought it might be wise were the city to operate the plant instead of allowing control to be invested in individuals.

During the month of March the following payments were made on account of street lighting in Buffalo, N. Y.: Buffalo Gas Light Company, $7,394.91; Mutual Gas Light Company, $3,667.13; Citizens Gas Company, $1,616.70; Brush Electric Light Company, $9,392.89. Total, $22,071.66.

The Clark University buildings, Worcester, Mass., which soon will be ready for the housing of students, are to be lighted by gas, provision for the laying on of which has been made in a most novel but thoroughly effective manner. Mr. Chas. F. Tew, who superintended all the details, will likely be pleased to answer any inquiries about the plan adopted.

The charter of the San Antonio (Texas) Gas Company has been amended so as to enable it to legally carry on the business of electric light supply.

The Obligation of a Municipal Corporation to Light Streets.—The following decision in this regard will be of interest—it was forwarded us from St. Louis, Mo.: In April, 1885, the corporation of St. Paul, Minn., caused a certain crosswalk to be put down, the approach thereto from or to the footway being facilitated by the placing of a singl stone step. On one night the following October, a Mrs. Miller and her

husband had occasion to use this walk, and while stepping from the step to the crosswalk the woman fell and was severely injured. She subsequently brought suit for damages, alleging that the street at this point was not lighted; that the step should not have been placed there, because the city could have so graded the footway and its approaches as to have rendered it unnecessary; and that, in any event, the stone was improperly anchored because of the failure of the city's contractor to properly bed it. Complainant secured judgment in the lower courts on the first claim, the second and third being thrown out; but the corporation appealed to the Supreme Court of Minnesota, who found for defendant, Judge Mitchell, delivering the opinion. The portion of it referring to the city's liability for not lighting the roadway is as follows—it was admitted that the street was not lighted: "No ground of negligence is shown here. Although a city has the power to light its streets, it is under no obligation to do so, unless its charter especially imposes that duty upon it. Of course, the fact as to whether a street was lighted or not may, in many cases, have a material bearing upon the question of negligence, for the manifest reason that a street left in a certain condition may be reasonably safe if lighted, but dangerous if unlighted; but there is not, as we have said, any general obligation on a city to light its streets."

THE Key West (Fla.) Gas Company has, we understand, completed arrangements to install an electric light plant of the Brush type.

THE Brockton (Mass.) Gas Light Company's capital was recently increased to $100,000, from $64,000, which necessitated the emission of 360 shares, par value, $100. The new stock was put up at auction, and the entire block was purchased by Mr. Malcolm Peters, Manager of the Company, at his bid of 100. The Company paid a dividend of 7 per cent. last year, which amounted to something over 35½ cents on each thousand cu. ft. of gas sold.

LATE last month a queer accident occurred in Cambridge, Mass. A good-sized schooner was lazily winding along the Charles river, when her slight progress was suddenly checked. She had, in some unaccountable way, fouled one of the Cambridge Gas Light Company's mains, and with sufficient force to fracture it. That evening much discomfort was occasioned to some of the Company's patrons, but Mr. Allyn soon made matters straight.

WE have advices from Akron, Ohio, dated March 27, which state that on the previous evening the Council considered an ordinance giving the Akron Artificial Light and Fuel Company the right of way through the streets. Mr. O. N. Guldlin, of Pittsburgh, Pa.—by-the-way, this gentleman was admitted to membership in the Ohio Association last month, when he gave his headquarters as Fort Wayne, Ind.—appeared before the Council, described the great success of fuel gas in Pittsburgh, and announced that he was ready to negotiate for the establishment of a fuel gas manufactory at Akron. The newcomers at Akron pledge themselves not to charge more than $1.50 for illuminating gas, and not *more* than 75 cents for fuel gas. Does the plot begin to thicken? Well, it would seem so. Now, let the Akron Company throttle the Guldlin scheme. It has the power to do so.

DENTON, Texas, wants a gas works. Denton is the capital seat of a similarly-named county; is on a small affluent of the Trinity river, and on the Dallas and Wichita Railroad at a point 40 miles northwest of Dallas. Population, about 4,000.

INSPECTOR MCCARTHY reports that the gas supplied by the San Francisco Gas Light Company during the week ended March 26 had an average illuminating value of 20 candles; while the Pacific Gas Improvement Company's product averaged 19.15 candles during the same period.

WE understand that what is known as the "Staten Island process" of gas making is either to be or is being introduced in the Mt. Vernon (O.) works. Perhaps Mr. Kirk's Company would act discreetly by making inquiries of the operators of the Panama (S. A.) Company as to their estimate of the value of the aforesaid process.

THE new gas plant for Ishpeming, Mich., is to be in working order by Sept. 1. The contracts have been given out, and when the snow and frost have vanished for the season a large force of men will be put at work.

IT will be remembered that at the annual meeting of the Portland (Me.) Gas Light Company the city, which owns 1,700 shares of the stock, made a strong fight for representation in the Directorate. The other stockholders, however, thinking that control should carry the day in respect of selecting a complete Board, outvoted the city and named their representatives. The Council then agitated the matter of selling the city's shares, but subsequently thought better of the idea. Last month the proposal to part with the stock was once more bruited, Mayor Chapman being the one apparently behind the movement, since it was he who, early in March, offered in Council the following resolution: "That the Committee on Finance be and are hereby authorized to advertise for bids for the 1,700 shares of stock in the Portland Gas Light Company owned by the city, or for any part of same, reserving to the City Council in such advertisements the right to reject any and all bids that may be made." Both branches of the city government assented to the proposition; but many of the taxpayers are inclined to question the wisdom of the action so taken. The *Argus*, in fact, rather pertinently asks, "Why is the Mayor so anxious to sell this stock, which pays a profit of 10 per cent., and whose market value is considerably above par?" Perhaps the Mayor wants to secure a portion of it himself. It looks like a pretty good investment, and windward anchors often keep financial barks from shoaling. The Mayor, however, will know that he has "been to an auction" if he eventually secures any of the stock.

THE Grafton (W. Va.) Gas Company is in the market for an electric light plant. They ought to have no difficulty in obtaining a specimen; unless, indeed, the bother sprang from an embarrassment of riches—in regard to the variety of types presented for their review.

IT is said that an excellent quality of caking coal has been discovered in Utah at a point 30 miles west of Price Station, on the Denver, Rio Grande and Western Railroad. Salt Lake City capitalists, including Messrs. T. R. Jones, W. H. Remington, and G. A. Lowe, will develop the deposit.

THE Baraboo (Wis.) Gas and Electric Light Company has been incorporated by Messrs. W. F. Wackler, Jno. Barker, and Arthur Remington. Capitalized in $30,000. Baraboo is the capital of Sauk county; is on the Chicago and Northwestern Railroad; is 37 miles northwest of Madison and 18 miles west-southwest of Portage City. It is a lively place, is sure to grow and improve, and is even now a fairly important manufacturing center. Population, about 5,000.

AT a recent meeting of the City Council (Peru Ind.) the Solons discussed the matter of repudiating the contract for public lighting which exists between the city and the Peru American Gas Company. For the remainder of the life of this contract the Company has the right to exact $45 per post, but, as said in the JOURNAL for March 16th, the proprietors of the Company voluntarily offered to perform the service for $22, provided the city would maintain 25 lamps in addition to the present number. At the "repudiation" meeting Mr. Clickard's resolution to annul the lighting ordinance was lengthily discussed, and Peru's shame would then and there have been consummated were it not for Mr. Oates and Mayor Graham. The former amended to the effect that the Clickard resolution, together with the proposition submitted by the Gas Company, be laid over until such time as both measures could be properly discussed in committee of the whole. The vote on the amendment resulted in a tie—4 to 4—whereupon the Mayor voted for postponement. One of the orators, Mr. McDowell, evidenced his knowledge of ancient literature by asserting that the long-term, high-priced contract or ordinance was "conceived in sin and brought forth in iniquity;" but his knowledge of the earlier history of Peru does not seem to have an equally musty flavor. The simple truth is that when Peru coveted a gas company, her authorities, in order to attract the necessary capital to carry on the enterprise of furnishing light to her citizens, freely and anxiously pledged local faith for the performance of her part of the contract. Indeed, the authorities of that time "pointed with pride" to the favorable terms which had been made on behalf of the city; in proof whereof we refer the Councilmen to the official minutes of their predecessors in power. The truth of a decade ago is the falsehood of to-day—in the mind of the average City Father, at least.

Mr. Henry Pratt (who made such a creditable record for himself in connection with the Superintendency of the old West Side works at Chicago), having decided to launch out in the business of plant construction, resigned his berth with the People's Company on March 31. His former employees thoughtfully timed his departure by presenting their late manager with an elegant watch and chain. He also has their best wishes in his new sphere of labor.

THE LA CROSSE (WIS.) COMPANY.—When, in 1863, ex-Senator Cameron, Mons Anderson and others organized the La Crosse Gas Light

Company, they were content to erect a very modest plant, and little thought that in a double decade the controllers of their venture would make more gas in a day, than the original plant could turn out in a month. Such, however, is the fact, and there is every indication that still greater results are close at hand. The present plant is a model in its way, completely equipped with the needed appliances to manufacture gas cheaply and well. Within the last year or so a considerable amount of money was expended on plant enlargement and main extensions; and Secretary and Gen'l Manager McMillan (who has been in the Company's service for a score of years) now rests easily, content in the knowledge that the demands of the La Crossites for gas will not be made in vain. By-the-way, it strikes us that McMillan must be kept on the go most of the time, for, besides his gaseous occupation, he figures as Secretary and Gen'l Manager of the La Crosse Brush Electric Light and Power Company, and is President of the La Crosse Provident Building and Loan Association, as well. Between his efforts and those of President A. H. Anderson (who, we believe, is a son of Mr. Mons Anderson, the first executive head of the Comp ny), the residents of La Crosse can count on having their lighting needs carefully ministered to; no matter whether they elect to patronize gas or electricity or both. It might, in closing, be said that the Company's new, double-lift telescopic holder (capacity, 140,000 cu. ft.), built last summer by the Kerr Murray Manufacturing Company, works perfectly. The Company, it should be understood, now supplies gas to North La Crosse, formerly an independent town on the north bank of the La Crosse river, but latterly known as the 5th Ward of Brother McMillan's bailiwick.

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Electrical Records from New Orleans, La.—A correspondent sends along the following, which, no doubt, will be read with interest: "On March 24 U. S. Marshall Pleasants (acting under authority of the U. S. Circuit Court for the district, in the matter of the Westinghouse Electric Company, of Pittsburgh, Pa., against the Brush Electric Light Company, of New Orleans), seized the entire property and plant of the last-named Company. The seizure was made on several judgments recently rendered against the New Orleans Brush proprietors, amounting in total to $32,000. Other indebtedness, recognized but not formally entered in judgment, and held by others than the Westinghouse folks, brings the grand total up to $86,000—a pretty good Irish dividend for the stockholders to contemplate. The judgments obtained by the Westinghouse home Company were for balances due on the incandescent type of plant furnished by the creditors. Mr. E. H. Farrar, attorney for the Brush Company, made the following plain statement as to why his client gave up the ghost—figuratively, that is; but quite practical speaking financially: 'The claim of the Westinghouse Company is the balance due on the incandescent plant sold to and used by the debtors. The Brush Company here was at first engaged, as will be remembered, in supplying arc light of the Brush type. That business becoming unprofitable, on account of competition by the Louisiana Electric Light and Power Company, the Brush Company concluded to add the Westinghouse system to its plant. In order to place the business in *competition with gas*, the Brush Company was compelled to make the charge for the service lower than that of gas. For the work it undertook to do it had insufficient boiler and engine power. As a result, interruptions and breakdowns were constantly occurring. *The coal bills literally absorbed the Company.*' Another gentleman interested in the concern says that about 600 shares of the stock are owned by the home Brush (Cleveland) Company, while the remainder is held in New Orleans. He adds, by way of easing the breakdown, that the New Orleans shares are so *generally distributed*, and the sum in *each particular instance* so small, that no great hardship can result because of the failure." The judgment holders did not shut down the plant, over which Marshall Pleasants placed S. H. Bell—Secretary of the defunct Company—temporarily in control. Mr. Denniston's remarks at Sandusky are worth pondering. Our own views in respect of incandescent electric lighting are on record.

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Another electrical happening in the Crescent City occurred on the evening of April 3d, at which time George Sturm, an employee of the Louisiana Electric Company, was shocked to death in the dynamo room. According to the New Orleans *Picayune*, which reported the finding of the coroner's jury, it appears that Sturm (to use the newspaper's words) "had completed his day's labors, and stepped into another room for the purpose of changing his clothes. He had been perspiring, and the dampness caused the current to traverse his body." A little misty, we must confess; but coroner's juries are not very clear as to their inductions sometimes.

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Two days after the above fatality a New Orleans lad, named Cardinas, while leaning against an electric light pole, at the corner of St. James and Tchoupitoulas streets, was thrown senseless to the ground. The ambulance surgeon could not say whether the lad's injuries would result fatally. Take it altogether, New Orleans has lately had quite an experience with the current electrical—both in the matter of financial and physical shocks.

One of the young men connected with the Springfield *Daily Republican*—about as well managed a newspaper as there is in the country—has been inspecting the local gas works, and his impressions concerning the visit are faithfully reflected in the issue of the *Republican* for April 1st—a bad day, that, even for the ubiquitous reporter. He indulges in a decidedly poetical introduction, which includes such choice morsels as, "foreboding-looking range of buildings," "fairy devil's kitchen," "fantastic shadows," "grimness of the scene," etc., but when he comes to actual description we find him saying: "The retorts are huge ovens built of firebrick, and air-tight, except for the door," etc., which is not really so bad. He is a good deal worse when, having told how the coal is put in, he adds that, "as soon as it [the retort] is filled, a lead cover, plastered over on the inside with lead and glue, is planted up against the aperture," etc. This is followed by a plain, off-hand intimation that it "takes just an hour to extract the gas from each charge, and each retort will make 45,000 cu. ft. of gas per day," whereupon we are led to inquire why Treasurer Hallett has been so secretive about the way in which he secures such high heats and generally grand results? The Springfield journalist has plenty more to say about how gas is not made, but we think the excerpts above given are all sufficient to answer the purpose intended.

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Lighting Hints from Racine, Wis.—Supt. Rodgers, of the Racine Gas Light Company, like unto Supt. McMillan, of LaCrosse is a very busy man, for he is virtually in control of three Wisconsin gas plants—in Racine, Oshkosh, and Fond du Lac—each of which also has a tender in the shape of an electric station; although nominal independent organization is maintained in the electrical division of the business. About a fortnight age we received quite a newsy letter from Mr. Rodgers, and as it contains matter likely to interest the Journal's clients we take the liberty of publishing the following extracts from it: "The Thomson-Houston Electric Company have a plant at Racine, consisting of 190 two-thousand candle power arcs, and 1,000 Sawyer-Man incandescent lamps. I had, within the three last years, frequently applied to the Council for permission to operate an electric plant, or after the city repudiated its contract for street lighting, which lighting was turned over to the Thomson-Houston Company. At the start the Council granted an exclusive 20-year franchise to the Thomson-Houston folks, but the Mayor vetoed the scheme. Last fall, however, after I had put up a $15,000 bond, I was awarded an electric franchise, under which I am prohibited from charging in excess of $75 per annum for each 2,000-candle arc, burning hours being based on what is known as the Philadelphia schedule. The Thomson-Houston Company furnish the city with 115 high power arcs, burning all night, for $69.40 each per annum. They also furnish 50 store lights (extinguished at midnight) at the rate of $6.50, and 800 sixteen candle power incandescents for 70 cents each per month. Their contracts expire next October. We have 60 high-power arcs of the Brush type in duty, and thus light one Ward of our city. The lights burn until midnight, and we get $70 per year per light. For store lights (extinguished at midnight) we get $7 per month. Our electric station was started on Nov. 1, 1887. We make a good article of coal gas, which we sell at rates varying between $2 and $1.60, according to the quantity consumed. Three years ago we furnished gas to 231 public lamps, receiving for it the sum of $1.60 per thousand. When the electric fever seized our authorities we offered to supply gas to the lamps for $1 per thousand, but they declined our proposition."

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At a special meeting of the Mutual Gas Light Company, of Southbridge, Mass., called on the 5th inst. for the purpose of considering the advisability of purchasing the plant of the Southbridge Electric Light Company, the stockholders voted that it would be inexpedient to secure the property, etc.

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The Brockton (Mass.) authorities have authorized the Gas Company to light the central fire station, which means that the incandescent lamps hitherto used were unsatisfactory.

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According to Director Wagner's figures, it seems that the lighting of Philadelphia's streets was accomplished last year in the following manner: 354 electric arcs, at a cost of $87,974.58; 5,297 gasoline lamps, at a cost of $116,586.09; 472 gas lamps in the Northern Liberties District, at a cost of $10,701 45; 16,473 gas lamps (less 1,062 not lighted because of their proximity to electric lights), making a total of 22,596 lamps, at a total cost of $215,262.07. The Gas Bureau paid for maintenance, etc., of lamps under its care $174,125.85, which is equivalent to $486,711.42 at the rate charged consumers for the 440,358,181 cu. ft. of gas burned.

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We understand that Mayor W. G. Whipple, of Little Rock, Ark., has secured the electric plant which he is responsible for foisting on that city. The Fort Wayne Jenney folks secured the plum, they to put in a plant to consist of 4 towers and 90 arcs, and to receive therefor the sum of $27,000. The plant is to be fully paid for at the end of 4 years, and the light is to be turned on by July 1. The Jenney Company guarantees the apparatus for

5 years. Mayor Whipple figures it out that $6,000 will represent the annual expenditure for operation.

It appears that the syndicate which is so anxious to secure control of the Richmond (Va.) city gas works numbers within it Maurice B. Flynn (the gentleman who figured before a New York grand jury not so long ago) and Mr. Henry Steers, President of the Williamsburgh Gas Light Company. These gentlemen are largely interested in the supply of electric light in Richmond, Mr. Steers, in fact, being President of the Virginia Electric Light and Power Company.

The Gravesend Gas Light Company has not as yet any more striking existence than that shown by a charter, etc.; but it seems these have been imposing enough to induce the American Loan and Trust Company to (nominally) accept them as security for a $50,000 first mortgage loan.

Capt. White is under contract to put in four benches of 9's, under the McIlhenny furnace system, at the St. Paul (Minn.) works. The St. Paul folks certainly have a variety of processes within their walls.

Annual Meeting, Chesapeake Company.—At the annual meeting of the stockholders in this Company the following Directors were chosen: Messrs. H. J. Davison, C. F. Dieterich, E. C. Benedict, W. S. Carroll. W. H. Gebhard, J. H. Clark, C. F. Tag, D. D. Mallory and O. Reeder. The Directors selected the following officers: President, C. F. Dieterich; Vice-President, J. H. Clark; Treasurer, W. S. Carroll; Secretary, A. B. Proal.

The Alabama river was more than ordinarily unruly this season; and among those who suffered considerable damage during its recent overflow may be counted the Montgomery gas men. They had to shut down the works on March 29, but how long the siege lasted we are unable to say.

A fortnight ago we reported that in consequence of the satisfactory operation of the new plant at Charlottesville, Va., the Committee on Light made a 20 cent reduction in gas rates. The good work still goes on, for Supt. Williams informs us that another cut—this time a 30 cent one—has been authorized. The net price is now at $1.50. In addition to this last concession all meter rentals were done away with.

Messrs. Wiltsie & Son, of Newburgh, N. Y., a banking firm which was largely responsible for the introduction of arc lighting in that pretty city, have gone to the wall. Their Newburgh pet electric company goes to the ground—if it did not in reality do the dragging—with them. Well-informed parties say the stockholders will be completely wiped out.

The Waterbury (Conn.) Gas Company charges $2 per M. gross, 12½ per cent. discount for prompt payment being allowed on all monthly bills lower in value than $30; which discount is increased to 25 per cent. on bills of $30 and over.

The Maryland Legislature has passed a bill regulating the maximum rate for gas in Baltimore at $1.25. The Governor has signed the measure. It is reported that the Companies will once more endeavor to arrange a basis on which they may consolidate.

The capital stock of the Fishkill and Mattawan (N. Y.) Gas Light Company has been increased to $30,000.

Jno. Callahan, formerly at Glens Falls, N. Y., has been put in charge of the plant of the Whitehall, N. Y., Gas Company.

The Equitable Gas Company, of Baltimore, is a defaulter in respect to the payment of interest charges on its bond issue—$1,000,000, at 6 per cent.

Coal has been substituted for natural gas at the pumping station of the Olean, N. Y., water works. The Company wanted to make a 20 per cent. increase in selling rates.

San Salvador, Cal., wants a gas works, and is likely to be accommodated.

At the annual meeting of the stockholders of the Consumers (Newburgh, N. Y.) Gas Company the Directors chosen were Messrs. J. H. Perry, Detroit, Mich.; O. H. Laurence, Fitchburg, Mass.; J. C. Adams, J. L. Corwin and B. J. MacDonald. Mr. Adams was subsequently made President; O. H. Laurence Vice-President, and B. J. MacDonald Secretary and Treasurer.

## The Heating of Wires by Electric Currents.

*Industries* says that the extended use of fuses in electric light installations has rendered the question as to the heating of wires by electric currents one of considerable practical importance, and the results of a long series of experiments made in this connection by W. H. Preece, F.R.S., were recently submitted by him to the Royal Society. The experiments were taken for three temperatures: First, the melting point of shellac, which is 77° C.; second, the point of self-luminosity, which for all substances may be taken as 525° C.; third, the fusing point, which is different for the different metals. Mr. Preece experimented with wires varying in thickness from 4 to 40 mils., and comprising the following materials: Copper, aluminum, platinum, German silver, platinoid, iron, tin, lead, and an alloy of tin and lead. For wires varying in diameter between 10 and 40 mils., the current which produces a certain temperature is for each wire given by the product of a constant, and the diameter to the power of $\frac{3}{2}$. For smaller wires than 10 mils. this formula does, however, not hold good and the current is more nearly proportionate to the diameter.

In order to eliminate errors due to the cooling effect of the terminals, the samples experimented upon were 6 inches long, being clamped between the terminals upon a dry wooden stand; but a second series of experiments was also made for wires stretched between terminals 1¼ inches apart, so as to determine the fusing point of short wires such as are used in commercial cut-outs.

Mr. Preece arrives at the conclusion that the best metal to use for thin wires is platinum, and for stouter wires, tin. Platinum fuses like wax without explosion or scattering of molten particles, and tin, in moderately stout wires, behaves in a similar manner. Mr. Preece doubts, however, whether large wires should be used at all for fuses, because, owing to radiation, the surface keeps cool and solid, while the center is liquefied. The wire then bursts with an explosion, and incandescent particles are scattered in all directions with considerable energy.

# Correspondence

[The Journal is not responsible for the opinions expressed by correspondents.]

### A Letter from Port Hope.

Office of Gas Company, Port Hope, Ont., March 31, 1888.

To the Editor American Gas Light Journal:

After a good deal of experimenting, one of our local tinsmiths has succeeded in bringing out an improved gas cooker. It is simply a flat tin kettle with a copper bottom, and four sauce pans that fit into its top. A full boiled or stewed dinner can, with its aid, be prepared for 6 or 7 persons, the heat being supplied from one gas ring. Tea or coffee can also be made, and sufficient hot water will remain for washing the dishes.

Last summer I tested it in my own house, the showing made being satisfactory and economical. Several of our consumers who used it also speak highly of it. They say it does its work perfectly. As the food is cooked in pans in hot water, it cannot burn. The gas can be easily regulated to give the proper heat, and from that out no further attention is required. Another advantage comes from the fact that the meal can be kept warm for any reasonable length of time, by turning the gas down to the point where the water is simply kept hot.

A lady friend, whose house has no outer kitchen, last summer caused the two outer openings of her cooking stove to be fitted with the gas rings, when, with this kettle and a small tin oven, such as is used with coal oil stoves, she cooked for her family of 7 persons, also doing all her washing and ironing, during the three hot summer months, on a consumption of 6,000 cu. ft. of gas. The operation was performed with great comfort and freedom from heat, although her stove stood in its usual place in the kitchen.

My own stove is also fitted with rings, and we use it either with coal or gas, as the weather is cool or hot, or as the cook prefers.

Yours, J. Smart, Prest. Port Hope Gas Co.

### Leakage per Mile of Main.

Boston, Mass., April 10, 1888.

To the Editor American Gas Light Journal:

Pursuing the subject of "Leakage per mile of Main," I have figured on the latest report of the Massachusetts Gas Commission (just out) and find that for 54 coal gas companies in the State (the Boston Company not included) the average leakage for the year ended June 30, 1887, was 164,900 cubic feet; or, nearly enough, 450 feet per day of 24 hours. This is better than it was the previous year, when the average was 183,584. If the Boston Company is included in the list the average is increased to 172,125 cu. ft.

The highest leakage per mile of main given by any company is 562,746, or 1,540 per day, and the lowest is 31,632, or 87 feet per day, which seems very low. Yours truly, *

[Official Report.—Continued from page 226.]

**Fourth Annual Meeting of the Ohio Gas Light Association.**

Held at the Sloane House, Sandusky, Ohio, March 21 and 22, '88.

Second Day—Afternoon Session.

Mr. Herman Wilkiemeyer, of Lancaster, Ohio, read a paper on—

## THE LEGALITY OF MAKING MORE THAN ONE-YEAR CONTRACTS WITH CITIES.

The question as to whether or not the Council or Board of Aldermen of a municipal corporation have the power under the laws of the State to make contracts with gas companies, which are valid and operative for more than one year, is one that has as yet never been adjudicated by any of our courts. It is not such a query as may be answered off-hand. It requires research and thought, in order that an intelligent answer may be given. It is such a proposition as well might be submitted to the full bench of the Supreme Court for decision; and as it would be no hard task to find lawyers who would disagree to its proper answer, in this paper the proposition will be discussed as by a man of business. Therefore, the views herein contained are not claimed to possess that weight and authority as if they were expounded by a regularly licensed L.L.D. However, next to a lawyer, why should not we "men of gas" be particularly appropriate individuals to discuss questions the settlement of which employs our common commodity to such a great degree?

The policy of the law makers of this State has not been characterized by any great liberality toward gas companies. They have been singled out and made exceptions to the operation of the ordinary rules of the law of contracts. The State has assumed (whether rightfully or not is not germain to our subject) the power of dictation, insomuch as it regulates our prices according to the views of a City Council, and deprives us of fixing a price upon our own commodity. The growth of this adverse legislation may be easily traced and accounted for. It is of no new origin, but begins at the beginning. It had its inception in the innate jealousy that obtains against all corporations, and is more forcibly expressed against us because we are nearer to the people; because we sell what they all must have; because we, in obeying the scriptural injunction, "Let there be light," come closer to their daily and nightly lives than a railroad company or a lumber syndicate. Towns of the common size have but one gas company, and therefore the latent animosity of the whole town is directed against the one corporation in their very midst. While all other industries are encouraged, gas companies are restricted and their every move viewed with jealous eye. No grants are made to them without the receipt of more than an equivalent. They pay full value for any franchise in one way or another, but principally by a curtailment of their rights. It seems strange that a city has power over gas companies to such an extent that for ten full years it may fix the price of gas arbitrarily and without any regard to the fluctuating cost of material and labor. The town or city says to us, "From and after the passage of this our law, it shall be unlawful for you to charge or receive more for your gas than the price which we say you shall charge."

What private individual transacting any other business would submit to such an infraction of his rights? What grocery man would not resort to the courts for relief against a law fixing the price of his coffee or sugar at so much per pound, without regard to the state of the markets, the crop in Brazil, or the corners of Claus Spreckels?

But while this statute (2478) has been upheld by the courts of highest resort, it certainly seems, to the mind of a person unskilled in the intricate sophistry and technical subtleties of the law, that there is injustice somewhere. Why should a gas company be bounden in a contract for a specified term when the city, the other party to the contract, is incapable of binding itself for more than a portion of that time? Such the law seems to be. But the purpose of this paper is not to find fault with the law, or to show what the law should be, but to ascertain and explain, if possible, what the law really is; and with this we come to the discussion of our question without further preliminaries.

The first provision in our statutes which affects gas companies in any way may be found in vol. 66, p. 218, of the Annual Laws of Ohio; or section 2478 of the Revised Statutes. By this section it is provided that "The Council of any city or village in which gas light companies may be established are hereby empowered to regulate from time to time the price which such gas companies may charge for gas furnished by such companies to the citizens or public, and such gas companies shall in no event charge more for gas furnished to individuals or the public than the price specified by the ordinance of such Council." By the next section it is further provided that in case the Council fixes the minimum price at which it requires the companies to furnish gas to the citizens and the public for a period not exceeding ten years, and the company assents thereto by a written acceptance filed in the office of the clerk of the corporation, then it shall not be lawful for the Council to require such company to furnish gas for a less price during the term agreed upon, not exceeding ten years. The acceptance of such terms by the gas company has a peculiar effect. Ordinarily a person would suppose that when, as in such case, a proposition is made by one and accepted by another, the result would be—*a contract*.

An eminent authority on the law of contracts has written: "A contract is created when a proposition is made by one party and accepted by another." It would at first seem, then, by the acceptance that a contract was consummated, and that both parties would be bound for the term. But in a case reported, in 37th Ohio, State Judge White says: "That a provision in a city ordinance regulating the price of gas, continuing the price fixed for a specified period, operates, under section 2479 of the Revised Statutes, as a proposition to the gas company to supply gas upon the terms prescribed in the ordinance, which if accepted in the mode prescribed *precludes the city from lowering the price for the period named*," and in a case reported in 180 S., p. 263, the court says: "That the assent to the proposition gives the ordinance the character of a contract." It is the case ordinarily that the terms of a contract are reciprocal; that if time is of the essence of the contract that both parties thereto are bound for the same time. But, though the court in two different cases has declared that the statutory acceptance of terms by the company has the *effect* of a contract, we shall see that the *city* is *not* bound for the same period. By the acceptance of the so-called proposition of the city, the gas company does not hold the city to *take* gas at that price for the term mentioned. The only thing which is rendered obligatory on the part of the city is that it will not lower the price during the time fixed. If, as the courts say, there is a contract, it is a one-sided contract, in which the city, by the terms of the statute, is restrained from doing anything or being bound in any manner, or to any duty other than as the statute specially declares and provides for. The only duty imposed upon the city, therefore, is, as the statute says, it will not modify the price to the detriment of the companies during the term limited. The ordinary rules of contracts are changed by the operation of that statute as to the reciprocity of duty—when a city is on one side and a gas company on the other. The city, therefore, is not bound to buy gas for the term; it is only bound as to the price, if it *does* use it. Truly we should be thankful to the legislation which is so beneficent as to insure us, that while we are bound to a fixed price for ten years or under (the price being always the minimum) it will not be lowered if we assent in writing thereto. If there is no acceptance then the council can change the price as often and as speedily as they can pass ordinances to that effect.

Having discovered, then, that the effects of the ten-year ordinance, in so far as cities are concerned, is not to bind them to buy, let us discover, if possible, how, by what means and for how long can they bind themselves.

Ordinarily, persons, whether natural or artificial, have the power to make such contracts and to bind themselves in such manner and for such time as to them seems fit and proper. This is almost a self-evident proposition, and needs no argument or citation of authority in order to establish its truthfulness. It is only when a person is especially restricted by special statute from doing a particular thing that he loses the right to do it, unless it is inherently wrong. Otherwise the person (natural or artificial) has wide range and scope. He can contract as he pleases. But cities afford an exception to this rule. They only have such powers as are especially granted them, either in charter or by operation of the general law. Cities do not seem to be trusted to that extent which prevails with persons—individual and other bodies corporate. They are carefully watched by the law. They are tenderly guarded; their powers are held in check. As edged tools are forbidden playthings to children, so is the contracting power of cities liberally curtailed and restrained. The profligate minor heir would waste his substance before enjoying the sweets of possession did not the law declare him incapable of contracting during his minority. In like manner the state takes away and curtails the contracting powers of the city beyond its present need. The wasteful heir, the ward of chancery, may spend what he has in his pocket; but he is not allowed to mortgage his prospects—to draw on futurity. With more or less wisdom the State has done the same by her cities as the law does for the spendthrift minor.

The section of our statutes which operates as above stated is numbered 2,702, and provides, "That no contract, agreement or other obligation requiring the expenditure of money shall be entered into, nor shall any ordinance, resolution or order for the appropriation or expenditure of money be passed by the Council or officer of a municipal corporation, unless the auditor of such board or corporation, or if there be no auditor,

then the clerk thereof, shall first certify that the money required for the contract, agreement, or other obligation, or to pay the appropriation or expenditure, is in the treasury to the credit of the fund from which it is to be drawn, and not appropriated to any other purpose, which certificate shall be filed and immediately recorded. * * * And all contracts, agreements or other obligations, and all ordinances, resolutions, and orders entered into or passed contrary to the provisions of this section shall be *void*." In our opinion this section makes our way plain and clear to the answer of the query which we have been delegated to answer, for it is well known that the moneys and revenues of a city are derived from the yearly tax levies. Cities subsist upon annuities granted by and from the people. They have no bulk of coin or currency in bank against which they may draw for their regularly recurrent expenses. They are stipendaries, as it were, and cannot anticipate their revenues. They must be in funds before making, or before being able to make a valid contract. It would not do to argue that a city could, in contemplation of a contract extending beyond one year, levy a tax sufficient to meet the outlay which would be occasioned by the length of time for which the contract was to run; for by section 2,691 it is provided that all tax levies shall be for the purpose of raising sufficient funds for the expenses of the *current* year; and, by section 2,698, it is especially provided that Council shall not make appropriations or contract debts or obligations of any description exceeding the amount of taxes received for such purpose for the current year. So there is no way around the statute which we have cited above.

But suppose that the Council of this or any other city in the State should contract out and out with a gas company therein doing business for the purchase of gas at a specified rate for three, five or ten years. What steps would be necessary to make such contract valid and operative? There can be but one answer. The clerk or auditor of that corporation would, before such contract became valid and operative, be compelled to certify that the money to pay for the gas *is* in the treasury three, five or ten years hence; which is such an absurdity as to be apparent to the most obtuse, and such certificate would be a mere nullity and the contract void, the contract being in direct violation of express legislative prohibition. The most that the clerk or auditor could do would be to certify the amount already actually in the treasury to the credit of the fund intended to be charged, and by no possibility would his oath of office permit him to do more or go further. He may reasonably presume that the money will be in the treasury as the future tax times roll around; but he is required to certify to facts, and not presumptions, however reasonable they may be. This section, then, taken in connection with the others above cited, provides us with an easy solution of the problem before us. The Legislature has full power over municipal corporations and over their revenues and the disposition thereof. The Legislature in this State has exercised that power. The general rules of the law, reinforced by the express legislative restrictions above quoted, all lead to the inevitable conclusion that the Council of a municipality has no power to bind itself beyond the length of its purse strings, or the period of one year, the exercise of its power being limited by the statutes, as aforesaid.

There is, possibly, another consideration which leads us to the same conclusion irrespective of the "clincher" afforded by Sec. 2,702. It is this. The council of a municipality is acting in a fiduciary capacity. It is a body of trustees. Its composition changes yearly. Can it bind itself in a contract which it will never be called upon to fulfill, being out of existence? This question it seems is at least debatable. It may or may not have any merit, but we refer to it by way of suggesting, and let the determination of our problem rest upon the very conclusive operation of Sec. 2,702.

*Discussion.*

The President—This paper shows much study and investigation on the part of the writer, and contains a great deal of valuable information.

Mr. Sherrard—Was not the question of the power of a City Council to make contracts passed upon by the Supreme Court, in the case of the Cincinnati Gas Company, reported in 34, Ohio State Reports?

Mr. Wilkiemeyer—In my preliminary study of this subject I read up the different decisions rendered in favor of gas companies, and especially that of the Cincinnati case, but found no earlier ones than those cited in the paper.

Mr. Sherrard—The knowledge that Mr. Wilkiemeyer's paper would be read was, more than anything else, what induced me to come to this meeting—although I have been greatly interested by all that I have heard here to-day. Not being a lawyer, I do not put my opinion against that of the legal talent, but I may claim some familiarity with the subject through having been at one time obliged to investigate it. The 5-year contract under which we are now working at Steubenville was made in September, 1885, and we originally supposed its terms would be as binding upon the city as they were upon ourselves. We presumed the City Council acted within the power granted to it by the Legislature, under the section referred to. Before making the contract we investigated the subject in order to ascertain what power the Legislature had granted to municipal corporations, or what power was possessed by a city to make a contract with a gas company for a period not exceeding ten years. Those who desire to look this thing up for themselves will probably find more light shed upon it by the Cincinnati case, to which I have referred, than from any other; although two or three other cases —unfortunately I cannot recall their names just now—may be referred to with profit. One of these, I think, is indexed in 28, Ohio State, where the same principle is decided by the Supreme Court, the opinion having been delivered by Judge McIlvane, whom we know and in whose good judgment and honest opinion we all have confidence. According to my recollection the statement is there made that it would be "monstrous"—the very word used—if the Council of a city of the first, second or third class had not the power to bind itself, if it bound the other party; further, that a city, within certain limits, possesses such power. A bond issue was the subject in dispute, and the moot point was whether the Council had a right to issue the bonds, and, having issued them, whether it could bind itself in future years to pay interest thereon.

A Member—Were the bonds issued to build gas works?

Mr. Sherrard—According to my recollection the issue was made for the purpose of aiding a railroad company to build its shops. Having issued the bonds (of the coupon variety, and payable in 20 years), a taxpayer procured an injunction restraining the city from obliging him to pay his portion of the interest or principal and interest, or for inserting the same in the tax levies. He claimed that the Council had no right either to issue the bonds or to bind future Councils, as the members thereof were elected each year, or for two years, as the case might be. In other words, the petitioner asserted his belief that, owing to the likelihood of a change in the personnel of a Council, when the terms of the old members had expired, a Council could not bind a city beyond the life of the Council; that its acts did not have force beyond the term of its existence. Judge McIlvane decided it was a monstrous doctrine to hold that a city, having the right by act of legislature to issue bonds, could not make those bonds payable in after years, and prepare for their redemption by means of a levy upon the taxable property of the municipality pledged as security. Another question in the case was whether, under the new Constitution of Ohio, any city in the State had the right to issue bonds to bind its citizens and their property for railroad purposes. The Supreme Court said that if done it must be accomplished under the general law, and not for a specific instance; and they also decided that as those bonds had been issued under the general law, the city—I think it was Lima—must be held to its contract, which had been legally entered into. On the contrary, had the issue been made to suit a specific instance —had the law said specifically that Lima, or Sandusky, or Dayton might perform such an operation, the contract would have been invalid under the new Constitution, which prohibited special legislation. To come back to the Cincinnati case. You all know that Gen. Hickenlooper was, for four or five years, in doubt as to whether or not he had a contract with the city of Cincinnati; but when the argument had been carried to the court of last resort it was decided he had a contract that you and I had no right to infringe upon. In this instance, by implication at least, the Supreme Court decided that the city is bound for ten years.

Mr. McMillin—Was not this decision based on the fact that the charter of the Cincinnati Company was good under the old Constitution?

Mr. Sherrard—I am not clear but that you are right. I only refer to the fact that the Supreme Court has, by implication, passed upon the question arising out of that case, in a decision saying that a municipal corporation may bind its citizens and itself for a period of ten years under the new Constitution, and under the present laws, and under the statute which has been read.

Mr. Wilkiemeyer—Mr. Sherrard's citation affects a bond issue, which is beyond the scope of a City Council, since the State law regulates how and for what the bonds may be issued, and provides a course, specific and positive, as to interest and redemption methods.

Mr. Sherrard—As I understand it, the Legislature grants power to the Councils of all our Ohio cities to make contracts (sec. 2702) with gas companies, for a period not exceeding ten years. Now, you say in your paper that, while this is true, the only party bound is the gas company. You claim that the Council has no right to say, within the period of ten years, that the price of gas shall not be put lower than the rate named in the contract. If the 10-year contract is made on the minimum basis of $1.50, you say it has no right, within that ten years, to put it down, say, to $1.30. It restricts itself not to alter the price named in the con-

tract. Now, I would like to know if the original or subsequent City Councils have no control—if the Council of to-day can fix the price for ten years and the Councils of four or five years hence have no power to cut the rate below the contract price, why, and by the same reasoning, they may not contract for a period of more than one year, and why succeeding City Councils are not bound in the same way to carry out that contract.

Mr. McMillin—The Burns Measure being a later law, gave the right to make a contract for ten years; but a law was afterwards passed saying that City Councils shall not make a contract for the payment of any debt for which the money is not at the time in the treasury. Repealing the other law does not annul the right to make a contract for more than a year, or for a longer time, provided the necessary sums to cover it are in the treasury.

Mr. Sherrard—The new Constitution took effect in 1853. In 1859 a law was passed (which remained in force up to the time of the enactment of the Burns law), by which City Councils were required before they could make a contract, to provide the money for carrying it out.

Mr. McMillin—They must provide the means; that is, the law requires the money to be in the treasury.

Mr. Sherrard—This, although no new matter, is one in which we are all interested, for it is very essential that we should know, before making contracts, whether we have the power to extend them beyond one year or not. In the case I referred to, and with which, no doubt, many of you are familiar, Judge McIlvane said there would be no inducement or encouragement for a gas company to make a contract with a Council, because (supposing it to be the case of a company the building of whose works was dependent in a great measure upon the nature of the contract to be made with the authorities) investors would not be satisfied perhaps with an agreement liable to change at the end of a year. Does not the court imply, then, that a contract made by one Council is binding upon the next and succeeding Councils up to the life of the contract?

Mr. Wilkiemeyer—Since writing this paper I think a bill has been introduced in the Legislature of Ohio, by a representative from Cincinnati, giving the Cincinnati authorities privilege to contract with a gasoline lighting Company for five years.

Mr. Coverdale—But this Company cannot do any lighting on streets in which gas mains are laid.

Mr. Wilkiemeyer—The City Council has quarreled about it for the last three months without coming to a decision. No contract has been given simply because the people who want it cannot afford to take it for only one year. Wanting it for five years is, I think, their reason for introducing the bill mentioned.

Mr. Alexander—A bill passed by the Senate and House within the last 30 days allows a certain village to contract with an electric light company for a period of ten years. It was passed unanimously through both Houses, under a suspension of the rules, in about 25 minutes from the time of its introduction—so quickly, in fact, that it could not be printed.

Mr. E. C. Gwyn—The City Solicitor of Springfield defines the law in this way: That the City Council has the right to fix the price of gas for ten years, but that a new contract must be made each year with each Council, although he admits they can bind themselves not to change the price within ten years. In Springfield, in 1887, the price was at $1.50 for five years; but a new contract must be made each year. They do not bind themselves to *take* the gas or to light any given number of posts, except for one year at a time.

Mr. Bate—Our Company has had this matter looked into by the best legal talent obtainable, who report to the effect that there is actually no limit to the time for which a Council may contract with a gas company for lighting its streets.

Mr. King—I do not know how far our Illinois statutes may agree with those of Ohio; but this is a live question, and one that I often have heard discussed. With us the general conclusion is that a Council cannot contract for a longer time than its own term of office. One case that was carried to the United States Supreme Court arose in this way. The City Council having advertised for bids for lighting the city for ten years, a committee was sent East to induce foreign competitors to bid, and subsequently three bids were handed in; but the home company eventually obtained the 10-year award. In due time, for some reason or another, perhaps because of lack of funds and neglect to pay the contractors, the Council saw fit to repudiate the contract, whereupon the Company brought suit to recover some $40,000. The case finally reached the Supreme Court—the decisions in all the lower courts were adverse to the Company—from whence it was thrown out on a technicality, no decision on the merits having been given. In conversation a short time ago with the Superintendent of the Company I asked him if they proposed to take it up again, and he said, "No; we are satisfied we will never get that money unless it be through the election of a Council that shall consider the debt as a matter of honor. We can never recover it by law." One argument that I have heard made—it has not so far been mentioned in this discussion—seems to bear upon this question. A Board of Aldermen is elected for the specific purpose of managing the affairs of a city during the time for which its members were elected. This implies the handling of the city's money, and that they are to expend it as in their judgment may seem best in that time. Now, if you permit them to make contracts ahead where will that stop? Some one member may have a favorite policeman with whom he may wish to make a contract for a term of years. Would not such a contract be just as good? Can they spend all the money that may be coming in, in the next two years, on contracts which would be good? If the principle holds good in one case why not in the other?

The President—We would like to hear from Mr. McMillin on this matter.

Mr. McMillin—I fear that my knowledge in regard to this subject is extremely slight. Probably we are as conversant with it as an equal number of lawyers would be; and we all know that we can get any desired opinion on this question from lawyers. I had not before heard the idea, suggested by Mr. King, that Councils can legislate only for the time for which they are chosen. I take it the courts would look at that question about in this way: If the public good requires a contract to be made for more than one year, they would have the right to make it; and it would be the duty of the Council to make it. For instance, if you cannot get a gas company to erect works in your town unless you grant a five or a ten-year contract, barring the Burns law, it would be right and proper, as well as a duty, for the Council to make such a contract; although it would not be right or proper, nor for the public good, to hire a policeman for ten years. I think this would be about the view the courts would take of it. A year or two ago, in investigating this question somewhat extensively, I wrote to all the principal cities in this State in order to ascertain what the practice was—whether they were making contracts for more than one year; and if so, how. In our city we were unable to light the streets because, owing to the law being declared unconstitutional, they did not have sufficient money in the treasury to enable them to make the contract with us which they were willing to make. The parties lighting the city have not had a contract for three or four years—they have not even had instructions to light the streets; but they do light them, and when the Council gets any money in they give it to the contractors. Some time ago they asked our Company to light the street lamps on the basis of 75 cents per thousand cubic feet, and we have done so for the last year; yet they cannot make a contract with us. I found, from my inquiries, that a different practice existed in almost every city. In some places the gas companies said they had it on the very best legal advice obtainable that the Burns law was not intended to apply to gas companies, because a special act governing them was unrepealed. That would look like good law, but nevertheless it is something of an assumption. I believe in our State the courts have never been called on to decide this question; but several cities, acting upon the assumption that because there is a special law authorizing Councils to contract for ten years, and that that law was not repealed, thus causing the Burns law to become inoperative in their regard, are making long-term contracts—that is, in cases where the public derive benefit from the making of a contract for more than one or two years. In other cases the very opposite view has been taken. Those in dissent argue, notwithstanding the fact that the old law was not repealed, that the Burns law being the later law, therefore they cannot make a contract without having the money in the treasury. This is the view taken in Columbus. They are now putting up a great many electric lights, and do so without making any contract. The City Council does not agree to pay anything. It simply says to the electric light company, "If you can find enough gasoline lamps on a square which you can remove to justify you in putting in the electric light at each intersection, you can do so, and take your chances." If there are three or four gasoline lamps on the particular square, they "take the chances." Where but one or two lamps are found, they do not run the risk. The city has grown rapidly within the last ten years, during which time the Gas Company has not kept pace with it. Many of the old services are cut off, or else are unsound, and the posts for carrying the gasoline lamps are generally of wood and will not do later on for gas lamps; consequently we would have to spend probably $10,000 in getting ready to light certain portions of the city, and that we would not do without a contract. Were we lighting them now, and the city's finances subsequently became muddled, we would continue the lighting without a contract, but we would not feel justified in spending a large sum of money in this way, for fear that the City Council might be enjoined from paying for the lighting. The law

allowing City Councils to fix the price has (as was stated in the paper) been approved by the Supreme Court. That was done in a case carried up by the Ironton Company, which I was then managing. The City Council fixed a price which the Gas Company would not accept; whereupon they tried to vacate our charter. We beat them in the Common Pleas Court, then in the District Court, from whence it went to the Supreme Court. After three years time spent before that body the law was decided to be constitutional, and that the Council did have the right to fix a reasonable price—which in reality left it just where we started. We said their price was not a reasonable one, but they contended that it was. We afterward compromised it. As far as any light on the subject is concerned, I cannot give you a single ray. I move a very hearty vote of thanks to the writer of the paper. I think it is one of the best papers ever read before the Ohio Association. (Carried.)

This brought to an end the papers assigned for the afternoon session, and the time available before adjournment was filled in by a recital of the following:

### An Experience at Columbus.

Mr. McMillin—We had a somewhat unusual experience recently in Columbus, and as my thoughts have not been concentrated on the matter, you will excuse any symptoms of wandering in my narration of the case. About 4 or 5 weeks ago we began to hear complaints about our gas not being very good—not complaints of its illuminating qualities, but that it had a horrid smell. As we have in our purifying house a most careful man, I did not at first feel inclined to pay much attention to the murmurs; but they were repeated, until finally one of the Directors invited our President to go with him into a room, it had been closed up for some hours, in which was a lighted burner. The President reported to me the next morning that it was very bad gas. The day before I had myself gone over to see the gas tested at the second purifier, in which we were using oxide of iron—as oxide of iron does not cost us very much it is about as cheap to make the gas very pure as it is to make it only fairly so. The gas was pure at the outlet of the second box, and we would naturally suppose it to be so at the outlet of the third. The President tested it in the office with test paper and found it bad—right in our own office. That was something of a "stumper." I thought then that perhaps a portion of the gas was not passing through the purifying boxes. A test at the outlet of the centerseal showed the gas was all right at that point. We have a ¾-inch pipe running from all the different inlets, outlets and centerseals to one common point, where we can locate an obstruction in about two seconds, if we have any. We thought possibly some of those stop-cocks were leaking; but we did not find it to be so. We also have a pipe passing from the inlet to the outlet, put in at the time we constructed that part of the works, and thought it barely possible that we might locate the trouble there; but we hardly expected to, as once or twice before a suspicion that a leak existed at that point was disproved on examination. Still, the gas around town was bad. Then the order was given to run the water out of the station meter—being a desperate sort of case, we had to resort to desperate measures; and there had been no let up in the search for several days. When the Superintendent instructed the man in charge to drain the water out of the station meter he said that, suspecting the trouble might be found there, he had already done so, but there had been no improvement. On testing the gas beyond the station meter we found it to be all right. We then discovered that all the bad gas came from one holder—we have four holders, two of which were in use at this time. If we turned one holder off and put the other on, for 3 or 4 minutes the gas passing into the street would be good; but on changing back, in 3 or 4 minutes it would be bad again. So we drilled holes into the inlet and outlet of the faulty holder. The gas although good when going in, was very bad when coming out. Then the superintendent and assistant concluded to run the gas out of that holder. They ran it down, and filled it up next day with 350,000 feet; but the gas was still bad. In the meantime, we had changed the purifier that morning, and, of course, for an instant the gas, when changing, passed through the holder without going through the boxes, whereupon we concluded that possibly some foul gas was admitted—the inlet and outlet were close together—and that the foul gas had passed around and was coming out at the time we tested it. The superintendent having climbed to the holder roof, tested the gas from that point, and it was as bad there as at the bottom. By this time we were pretty badly "stumped." It was comparatively a new holder and tank. The water had not been in there more than a couple of years, whereas the water in the one from which we could run the pure gas had been in the tank for 15 or 18 years, at least; in fact, I believed it never had been emptied. So it did not look as if the trouble could be caused by the gas taking up impurities from the tank water. Then I remembered when we were excavating for the tank, there had been sufficient local pressure to force a stream of water up above the wall through the pipe of an old driven well which had been located in the ground—the men obtained drinking water from that pipe during the time they were constructing the tank. I also remembered there was encountered a strata of bluish clay or shale, which was probably as good a gas holding material as could be found in any place; and the thought occurred to me that the water might have been forced up through there by pressure of a small amount of natural gas in that shale. As our tank always leaked more or less the thought struck me that where the water went out of course gas could come in; and I thought for the time that that might be the reason for our trouble. And yet, when we came to figure on it, I remembered that I never had tested a shale gas which contained over eight-tenths of one per cent. of sulphuretted hydrogen, and there would have to be an enormous quantity of it going into the holder in order to give a trace of sulphuretted hydrogen in 350,000 feet of gas in a holder which had been filled for 12 hours. We held on to that theory as long as we could; but, being a tail hold, it soon slipped. Then we were about at our wit's end. All we could do was to send out from this holder after midnight, and during the day, or when not much gas was being consumed.

We ran along in that way for probably a week or two, when, by mere accident, we discovered just where the bother came in. We have a works for concentrating ammoniacal liquor—shipping the liquor in a crude but a concentrated form—located in a small building 25 feet square. The ammonia water is pumped into the still, and is there heated by steam, driven from the condenser, which forces the steam out, but will never pass over and reabsorb the ammonia when at the proper point. In other words, we probably get 75 or a 100 gallons concentrated liquor out of 1,000 or 1,200 gallons of ordinary strength. A portion of those condensers are laid in boxes or coils of pipe. A box located up here, say 12 to 15 feet, contains a coil of pipe through which the ammonia runs. A stream of cold water runs into that box, then goes through another, and then into a third. The third box is located a trifle below the final receptacle for the ammoniacal liquor, and very little ammonia and gas pass along there. We had for a long while a trace of sulphuretted hydrogen and ammonia, sulphide of ammonia, etc., from the destruction of the wrought iron joints, or the threads on the wrought iron pipes where they are screwed into the cast iron, and these had to be renewed once in a while. This stream of water from the coils of the pipes runs off into a little cistern and from there is pumped through to the boilers—it has a little less lime in it because of the temperature to which it has been subjected, and it is a little better water for that reason. The excess was allowed to run into No. 6 tank to make up for leakage. It then occurred to me that the sulphuretted hydrogen was going through some leaks in this condenser, was running into that tank, and was being pumped in a constant stream into this holder, hence the sulphuretted hydrogen discovered in the gas from No. 6 holder. On taking a portion of water out of that lower condensing box and testing in the usual way for sulphuretted hydrogen, the trouble was made plain, and our enemy was dislodged. It is a very simple thing, but as you are all liable to be struck in the same way, I thought it worth while to relate the incident.

### An Experience at Evanston, Ills.

Mr. Cosgrove—As this is an "experience meeting" I may be permitted to add a chapter. One evening, about a year ago (we had two holders) the gas from the holder close to the works would show a blue flame in the office burner. We could not explain it, it came and went so suddenly, although I expect we studied over it in our simple way about as hard as Mr. McMillin did. After many theories, all to no purpose, however, we finally ceased using the holder that gave the trouble early in the evening, and confined ourselves to the other. I finally found that the men had been changing a purifier just as we would light up, the small and offensive holder being the one which was on at that time, the larger one being turned on usually when the day men left the works. We also stopped changing the purifiers at that hour. In the summer time we put the small holder entirely out of commission, and examined it thoroughly. The inlet and outlet pipes had been tipped over until they almost met, and the reason therefor was speedily brought to light by remembering that previous to the appearance of the blue flame difficulty—the holder was not fenced in—a very slim horse had slipped into the tank and under the holder. (Laughter.) We did not know, however, until the holder and tank was subsequently examined that he was responsible for the air in our gas.

### An Explanation from Mr. Gwynn.

The President—Before adjournment I would like to give Mr. Gwynn an opportunity to make a statement concerning the paper read this afternoon on the policy of gas companies with respect to incandescent electric lighting.

Mr. J. Gwynn—What I have to say concerns the paper on incandescent lighting, and also refers to something said by Mr. Denniston during the discussion. Mr. Denniston stated he thought it was a good plan for a gas company to wait until the electric light stock reached 50 cents on the dollar on the original cost before they bought it. If they were going to purchase an electric light plant he thought that that was the proper time; but the question with me is whether it will pay a gas company to wait that length of time. It is a question with me whether a gas company will not lose enough business between the times suggested to pay for the original cost of constructing an electric light plant, besides having to pay in the end fifty per cent. in cash for a plant. I know that at Fostoria we have actually lost enough money, in the way of cutting prices, and in loss of business which we may never get back, to pay for the entire Fostoria plant; and yet to-day we do not own it. The electric company which came in there got enough subscribers inside of two hours to enable them to put in a plant sufficient to furnish 250 incandescent lamps—a 58 arc light plant was already in operation. The real effect was that, at one jump made in 30 days, they took from us over 50 per cent. of our business—*i. e.*, arc and incandescent combined. The only way in which we could get the business back again was by increasing our candle power and reducing our prices. To-day, we have just about got back to where we stood two years ago. We got back the business we had then, and are on the increase to-day; but we do not own the electric light plant, and also have still to fight, by means of low prices, for our business. We are now selling a 24-candle gas to large consumers at from $1 to $1.20, yet we keenly feel this competition with the incandescent light. Only last week they cut off three of our best consumers, by giving the latter incandescent lights at 35 to 50 cents per lamp per month. While I am satisfied there is no money in it, yet, at the same time, home parties who install electric light plants seem as a rule to have considerable money, and when they have the plant in operation they must either keep it running or sink the entire amount invested. Although I do not think they have as much money as we have, still they have as much grit, and seem bound to fight us as long as they are able to stand up. That was the threat of the gentlemen owning the plant—they would stand by the company as long as their money lasted. For my part I think if any gas company desires to go into the electric light business it might better do so before its business has been honey-combed or before it is compelled to hold it by heavy concessions in gas charges. My advice to them is—if their towns are sufficiently large, and if they have the right kind of directors—to handle the arc and incandescent light themselves, provided they can also get a fair price for it. This will keep competition from coming in contact with them.

Mr. Sherrard—How long would it take the Fostoria incandescent company to run its lights before sinking its total capital?

Mr. J. Gwynn—They have in their favor the fact that they are on the belt line of fuel gas. A belt pipe line owned by the city and some private individuals encircles our corporate limits—about 10 miles—and from this line the city furnishes the incandescent company with fuel for its boilers at $75 per year, which is almost free. You see that that puts them in a first-class condition for fighting—their rental payment on buildings amounts to only $100 a year. Their principal outlay is for salaries, and for wear and tear of machinery. Accordingly, you can understand they are in position to supply electric light very cheaply, and make their competition with the Gas Company very effective. Even under the circumstances, I do not think there is much money in it for them, although I have an idea they are about paying running expenses. As long as they can do this there is no reason why they should shut up. They of course are always on the lookout for possible purchasers, and are active in the pursuit of new capital to take hold of it.

Mr. Denniston—This requires a word on my part, inasmuch as Mr. Gwynn refers to my previous remarks. I asserted that the location and circumstances surrounding a Company should govern their action. It is simply a matter of business. What might be a good financial policy at Cincinnati might be a poor one in Columbus. Were our foresight as good as our hindsight, what changes would have been made in our actual course! Had Mr. Gwynn known that these parties proposed to make a vindictive fight—not simply to earn money in a fair commercial way, but to compel him to buy them out—it would have been his policy to throttle them at once by purchase. I also said i it could be shown to those in control of a gas company in this city or elsewhere that they could make money by putting in an electric light, they would likely make the investment; but when, from the facts before you, you know that instead of making money by the venture you are going to lose it, that even if you do determine to try it you cannot secure advantages equal to those a competing company would receive from the Town Council—why should you enter the field? I also simply asked the question, would it not be better for us to wait until they have secured this advantageous franchise—unobtainable by us, because a gas monopoly is looked upon with disfavor, as a general rule—including every possible right and privilege that a Council can grant, and when their stock has been distributed where it would do the most good, is it not then better to buy them out, paying them cash for what their plant may be really worth? If we take Mr. Gwynn's own statement, what do we find is the actual case at Fostoria to-day? Why, simply that the local electric light stock is not worth as much to-day as his gas stock. They cannot be making money at their selling rates; and could he do better than is being done by them, on the same basis? Take my own case in Pittsburgh. I do not believe they are making anything on their local lighting sales, yet I know that my competitors can afford to lose $1,000 each month rather than let me have control of their plant, because they want it as an advertisement to accelerate the sale of their apparatus in every other city and town in the United States. I say they could not afford to dispose of it. No; this thing comes down to a matter of business judgment. It is for yourselves to say whether or not you can afford to put in an incandescent light plant simply because two or three parties want the light, and whether you might better put in the plant yourselves at the prices charged by the sellers of such apparatus, or let someone else start it, and, when they have about tired of operating it, buy it from them for one-half what it cost them. This you will be able to do if you furnish good 20 or 24-candle gas at a cheap rate. If I am sound in that position, I assert that you can make money at $1 with 20-candle gas, when they cannot make money when selling at their present rates. I believe that under ordinary circumstances, provided you light the public buildings and the streets, you can make money at $1. I speak from my own experience. I know I could do it under those circumstances; in fact, I do not have all the lighting but still make some money. I know, further, that I could not get rights equal to those my competitors obtained from the Council, although I have occupied the field for a number of years. Mr. King's case is a decidedly exceptional one in this respect, for he seems to have the good will not only of the people but of the Council, for they were willing to concede to him rights which the Councilmen of other cities would very much prefer to give to a competitor. Human nature is the same the world over; and human nature admires competitors and competition, particularly in gas. A consumer cannot go across the street to purchase his gas from someone else when you refuse to make a reduction in prices. I dare say some of Mr. Gwynn's former consumers feel they have been wronged by the Fostoria Gas Company in one way or another. People of that nature are to be found in Pittsburgh, too. We are getting some of those dissatisfied ones back, and we are selling light more cheaply than the Westinghouse people. Consumers cannot get the same amount of light from a 16-candle incandescent lamp that they can from a 20 candle gas. At $1.50 per thousand gas light is better in quality and cheaper than 16-candle power incandescent electricity. Their lamps deteriorate right from the start. This, however, does not refer to Mr. Gwynn's statement. As before remarked, humanity likes competition. A few years ago, before the electric light boom, competing gas companies were in vogue and their projectors, in case you did not buy them off, would start a company, and for a time furnish gas at a loss to accomplish their ends. You know that often when the advance agents of these competing companies visited cities or towns they had no trouble in securing signatures to contracts whereby the consumers agreed to pay the newcomers higher rates for gas than the established company was selling at. You also know how these competing schemes were finally settled. With these schemes, as with the present electric competition, it was not those who sold the plants and rights that were caught. No; those who put up the original cash are the losers in the long run. I know in several places electric light stock has been bought for 50 cents and less on the dollar, within a year from the time the company was organized. I do not say this is so, generally; for it would be very foolish for me to so assert. Inquiry as to the circumstances surrounding your particular case must decide whether you had better buy right out and pay a good price (after they have established the plant) or fight them, and lose consumers, as I have done. You may say that there is but little satisfaction in my course to my stockholders. Why did you not buy them out? A year ago I could have bought out one competing company, at about 80 cents on the dollar, but did not want to. Perhaps it was not good judgment, but I felt that I would get it some day for less. Unfortunately for me I am situated in the immediate neighborhood of Mr. Westinghouse, and he had to assume control of this competitor—the Allegheny Lighting Company—in order to keep the Union Depot illuminated by incandescent lights. They are using incandescent lights all around me to-day. They now have 12 or 14 incandescent lights where but eight lights were used before. I cannot say positively whether they are making

money; but I do assert that I give more light, with gas at a dollar, than they do with their incandescent lights even at the low rate named by Mr. Gwynn.

Mr. Page—The electric light is here and it has come to stay. The arc lamp is now performing 75 per cent. of the public street lighting of our cities, and the small towns as well, and it always will. The incandescent light has also come to stay. It will be had even though it costs four times as much as it does now. Why? Because it is the most exquisite and easily obtained light in the world. Just turn the button, and there is your light. On board the Sound steamers Bristol and Providence, making the trip between New York and Boston, its convenience is well proven. If it was for no other reason than because you did not have to light a match, I would say that the electric light had come to stay. There is, however, another reason for its remaining with us, which is perhaps stronger than any of the others—I never yet have heard of any one being killed by blowing out an incandescent light. The Cleveland *Plain Dealer* recently reported a fatal case resulting, so it said, from the blowing out of a gas light by a man who was about to retire for the night. It is also said that a license for his coming marriage was in his pocket. The paper says he blew out the gas, but the paper lied. I say that in the last 3 or 4 years a gas jet has not been blown out by a sane man, woman or child. Every reasoning man here will endorse that statement. Certainly gas has put out lives, and we know the reason why; but it is not necessary to state it. I say the incandescent light, for this reason alone, has come to stay. Why? Because the people want it. What the people want they will have; if they have the money to pay for it. The next point I wish to make is this: If the two lights have come to stay, then it is better for the existing gas companies to furnish them. No extra salaries are needed, although the manager ought to have $500 more for taking charge of an electric light plant; and probably he would have it if the Directors were at all decent—in Ohio I understand the very best men in the community are selected as the directors of gas companies. The gas companies have their organization—secretaries, treasurers and managers—already in harness. It need not necessarily cost a cent more for executive management. Does it in Jacksonville, Mr. King?

Mr. King—Not yet.

Mr. Page—I say to you, gas men, you can supply electric light at a profit. Why should gas companies take it up? Because, in the first place, they have the cheapest fuel in the world. Those in the natural gas district can operate their dynamos with it, and get their supply as cheaply as it is furnished the independent operator. Mr. Humphreys, of Lawrence, Mass., says that it pays—those who know him know his head is pretty level, and that he does not take up anything unless there is money in it. So, also, may it be said of Mr. King, of Jacksonville. In addition to your present staff of men how many others will you have to pay when operating an electric light plant? Two to put in the carbons and one with some knowledge of electric lighting. The Institutes throughout the country are turning out plenty of bright young fellows who will be glad to help you at first, for $50 or $75 per month—men who have been educated by the very best professors in the world. There is your man to begin with; and he does not cost you much. I suppose that Mr. Denniston is one of those long-headed men (they never could make a point on him on the financial management of the business) who would not buy out the plant of an existing company at 80 cents on the dollar. He would prefer to buy a new one—the latest one, with all the latest improvements. The Westinghouse, or the Thomson-Houston Company will sell you cheaply a dynamo, for cash—the ordinary electric light company pays for it in stock, which is afterwards unloaded. I warrant you that they have not $10 in cash received per $100 dollars of paid up stock in a majority of the electric lighting companies of this country. You do not pay the Washburn & Moen Manufacturing Company in stock when you buy wire from them, you buy it for cash. Poles? Poles are cheap. My advice to every one representing a gas company would be, even though he did not have a consumer, to put a dynamo in his works within 48 hours—I would put up a little one at first; plant the poles and light my works with it. If you cannot get a charter from the city, go ahead anyway; you don't want one. See how they did at Toledo. Organize. A company has the right to go on its own premises, and to do thus and so. The gas companies of the United States are to be the lighting companies of the future. Electric light will not compete with you, unless you allow it. It is your own fault if you let electric light companies beat you out in a city. This sort of lighting is to be done by the gas companies. There is nothing that I wish for more to-day than that the gas companies of the United States would at once put in electric lighting plants. I wish so because it will be beneficial to them in the extreme. They make a tremendous row all over the country because the price of gas is $1 in one city and $1.80 in another. Why don't they complain about the electric light companies for the same reason? That there is reason for so doing, let me refer you to the Chicago *Tribune* of yesterday.

Mr. J. Gwynn—Mr. Denniston says the electric light suppliers cannot furnish as much light for $1 as a gas company can. If that is the case how is it there are so many electric lights in Columbus where gas sells at $1? It is very evident they must be furnishing about the same amount of light, or giving about as good service, else they would not hold their business

Mr. McMillin—Later on I will have something to say about that.

Mr. J. Gwynn—I think Mr. Denniston's remarks, with regard to electric light people being assisted by the local enemies of gas companies, are hardly borne out, because some of my friends in Fostoria have been using the electric light straight along and are doing so because they are really getting it for less money than at which I can afford to furnish them gas. You cannot compete against a charge of 35 or 50 cents for an electric light turned on at 4 P.M. and shut off at midnight. On the other hand, in the matter of arc lights, of course, as Mr. Page says, they are bound to get the street business, no matter what you do. The only way for a gas company to hold the street lighting is by operating an arc plant; and in some cases it is quite certain that it would not pay to so do. In certain Ohio localities known to me, where it would have paid the gas companies to operate electric light plants, it was determined not to, because the Directors objected. The fault was not with the management of the companies. If the Directors could have been made in time to see their error in such opposition, I think, in a great many places where the price of gas is now ruinously low, because of electric competition, the rate could have been maintained at a fair figure. At Fostoria we made the price (as I know from my own knowledge) lower than it ought to be, according to the population of the town; but we have had to do it in order to compete with their prices. If we owned the electric plant we could have kept the rates for both gas and electric light at a living figure. We would probably be furnishing Brush lights, burning from dark until midnight, at $9 or $10 per month, whereas they are getting only $5; and we would also be receiving some better rate than 35 to 50 cents for incandescent lights.

Mr. Coombs—This is a very interesting subject to me. At Youngstown we do pretty well with our arc plant, and at this time we are inquiring about the feasibility of starting into the incandescent field.

Mr. McMillin—I allowed the impression to prevail that I could not get here yesterday because of a meeting of the Columbus Board of Trade to be held last night; but it was in reality the electric light company which kept me. A representative of our Company read a paper here this morning, as I understand, concerning incandescent electric lighting. I have not seen the paper, did not hear it, and do not know what position the writer took; but I do most heartily indorse every word that Mr. Page has said. We are on good terms with our authorities, and have a great many thousand consumers, out of which number I only know of one who is unfriendly towards me; so that we are on pretty fair terms. We sell dollar gas, and put it at that figure before there was any talk of an incandescent company. We lowered our rate to $1 when our contract allowed us to charge from $1.25, upward. We furnish 18-candle gas, and those who desire to purchase Lungren lamps can have them at what they cost us. If they prefer to rent them we charge them 40 cents per month, making no charge for putting up the lamps. We try to keep up with the times; but yet there are 3,500 incandescent lights in our city. When the Edison people started up the arc company went into the business of furnishing incandescent lights, and they now have 1,000 lights in use. I was detained yesterday by some private talk with the President of the Edison Company, who put me in possession of certain facts unknown to me before. I find, in addition to the arc company's thousand the Edison folks have some 5,400 lamps, or a total of 6,400 incandescent lights in a district of a city where gas sells at $1 per thousand. If we were to sell gas at 50 cents, about 5,000 of those electric lights would stay there. We purchased an electric light plant three months ago, but have not put it up because we wanted to know how many other plants would be going before we put it up; further, we wanted to put it in the right place when we did start it. We might as well make up our minds that a portion of the community will use the incandescent light. In addition to the incandescent lamps in Columbus, there are over 300 arc lights, and the Council gives permission to them to substitute arc lights for street lamps, wherever they please.

Mr. E. C. Gwyn—I have in my mind the President of and largest stockholder in a gas company who lights his factory with arc and incandescent lights.

Mr. J. Gwynn—One word before we adjourn. Mr. Denniston says the electric light people can get better rates than the gas company. This

is quite likely. If he used as much money in buying up Common Councils as some of the electric light people do, he could get a like share of their favor. I know cases where electric light companies got extensive rights and broad franchises simply because their representatives had been closeted with some of the Councilmen. In one particular case the conference was with the chairman of the light committee. Of course, that means money. Mr. Harris, of Mansfield, can tell you that the Mansfield Gas Company purchased an electric light plant in a novel way. The electricians came to Mansfield, got a franchise, canvassed for consumers, completed the works, and then turned them over to the Gas Company. You can do the same thing in the same way.

Mr. Bird—With regard to the Mansfield case, I may say the ground is not entirely clear. While the Gas Company did get that plant, our Council, within the last week, has given a franchise to other parties also. The probabilities now are that we will have to buy out the newcomers in the end.

Mr. J. Gwynn—The Mansfield Gas Company, however, is on the ground, and with a business established. If the gas men give satisfaction in their electric department it will be hard for any other company to compete with them.

Mr. McMillin—I agree with Mr. Denniston in his statement that an incandescent company does not supply the same amount of light for the same money that a gas company does. Every store, to be as well lighted by electricity as it was before by gas, requires from 2 to 3 more lights. That does not make any difference, however, if it does not appear in the bill. I do not want you to think we are feeling at all blue in Columbus because there are so many incandescent lights in our city, for we are sending out at the present time 30,000 cubic feet per day more than we ever sent out before.

Mr. J. Gwynn—Does Mr. McMillin send out any more gas, by reason of the electric light competition, than he would if it did not exist?

Mr. McMillin—A great deal less.

Mr. J. Gwynn—That is just what I supposed.

Mr. McMillin—We would be sending out 100,000 cubic feet per day more if it were not for them.

A recess was here ordered.

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### First Day—Evening Session.

The Convention was called to order at 7:30 P.M. After Secretary Butterworth had read letters from Messrs. C. J. R. Humphreys, C. F. Prichard, G. A. Hyde, A. B. Slater, and A. T. Perry, Mr. Geo. W. Graeff, Jr., of Phila., Pa., read the following paper:

## A FEW WORDS ON INCANDESCENT GAS LIGHTING.

The title of this paper is meant to be definite. It is not the design of the writer to dip into the abstract questions that surround the subject of incandescent gas lighting, nor to compare the values of different systems of gases. These matters are in abler hands. The object of this paper is simply to contribute a mite to the general knowledge of the present status of incandescent gas lighting in this country, and to show, so far as possible, the shapes and performances of the different burners before the gas public of America. To this end, the writer has sought to obtain specimens of the various burners. This task has not been accomplished with the degree of success hoped for, and the representation of the burners is not so full as expected; but, with one exception, the burners exciting the most comment in the American gas fraternity are here presented.

We will first take up the Welsbach, the first presentation of which, outside the exhibition rooms of the Company, is made before this Association. This invention of Dr. Carl Auer von Welsbach, a highly distinguished pupil of the great Bunsen, has been so frequently described that a word-picture of it, especially with the burner itself in view, is scarcely necessary. Briefly, a hood or mantle of fine cotton thread, such as is here exhibited, is immersed in a solution consisting chiefly of oxides of zirconium, lanthanum, and yttrium, until thoroughly impregnated. This is then dried and shaped as shown in the specimens, fastened by a thin wire of platinum to the support shown. In this manner the mantle is suspended over a flame and fired, the fire almost instantly consuming the cotton fabric and leaving upon the support shown, and in the shape shown, the full mantle of oxides, which is at once incandescent. This mantle is then ready for service, and is suspended, as in the equipped burners exhibited, in an Argand fixture. It is easily lighted from the top of the Argand chimney, and is incandescent instantly at lighting.

When illuminating gas is used the gas is supplied through a Bunsen, and the burner fixture allows an easy adjustment to any grade of gas. When fuel or non-carburetted gas is used the Bunsen method is not applied, the gas being supplied without any admixture. What are, perhaps, the greatest triumphs of the Welsbach have been won with the use of natural gas, although the economical features of the burner are not so necessarily put to the front where this gas of nature is to be had almost for the asking.

In noting the use of the burner with the different gases that are or may be put into use, it may be stated that by changing the component nature of the solution into which the mantles are dipped, the mantles can be so prepared as to yield either a white or yellow light, as desired. This is a valuable aid to the adapting of the burner to different gases under varying circumstances. The mantles in the burners here shown are of the yellow kind, as may be seen by the color of the light given.

As concerns the consumption demanded by the burner, and the photometric tests made, it is only necessary to state that the tests made upon the other side of the Atlantic, and widely published there, have been fully borne out in this country. I append, for convenience, a synopsis of the tests made by Mr. C. W. Cooke, and also a record of the results obtained in another series of British tests.

| Burner. | Pressure on the Gas, in Hundredths of an Inch. | Consumption, in Cubic Feet, per Hour. | Illumination, in Standard Candles. | Efficiency, or No. of Candles per Cu. Ft. Gas Consumed per Hour. |
|---|---|---|---|---|
| A | 90 | 2.20 | 18.6 | 8.1 |
| B | 90 | 2.40 | 17.5 | 7.3 |
| C | 90 | 2.55 | 19.5 | 7.6 |
| D | 125 | 2.36 | 20.0 | 8.5 |
| E | 125 | 2.25 | 19.0 | 8.4 |

| Burner. | Pressure on the Gas, in Hundredths of an Inch. | Gas per Hour, in Cubic Feet. | Illuminating Power, in Standard Candles, Corrected. | Candles per Cubic Foot. |
|---|---|---|---|---|
| A | 60 | 2.05 | 18.96 | 9.25 |
| | 70 | 2.20 | 21.00 | 9.55 |
| | 80 | 2.42 | 21.90 | 9.05 |
| B | 60 | 1.95 | 19.02 | 9.75 |
| | 70 | 2.10 | 20.75 | 9.88 |
| | 80 | 2.30 | 21.19 | 9.21 |
| C | 90 | 1.85 | 18.40 | 9.94 |
| | 110 | 2.02 | 21.60 | 10.69 |
| | 130 | 2.20 | 22.60 | 10.27 |

This latter record is from the able paper of Mr. James Dredge, prepared for but not read at the 1887 meeting of Mechanical Engineers, at Washington, D. C.

I particularly note these tests, as given in Mr. Dredge's paper, for two reasons:

First, to corroborate their results by a statement of the only photometric tests of the burner made by myself, which showed an average result of 10 candles. These latter tests were made with the 17-candle gas of Philadelphia.

Second, to correct the very evident impression under which Mr. Dredge and others have left the gas public with regard to the strength of these Welsbach mantles. These writers have sought to teach that the Welsbach mantle is extremely fragile, and that it will not bear handling, excepting in the most cautious manner. We have heard of attempts made to bring specimens of the European Welsbach to this country, and that none of these attempts have proven successful, the burner having broken in each instance. In this connection, I wish to say that, so far as I can learn, the European Welsbachs are not prepared for transportation. The burners, as made in this country, are. The method of this preparation is a simple one, consisting merely in coating the made-ready mantle with a preparation, which I understand to be chiefly composed of paraffine. This treatment renders the mantle softer and more flexible, as in the specimens shown, and, in this condition, the mantles can be packed and sent to the uttermost parts of the earth. For shipment, or easy carriage purposes, pasteboard rolls or tubes are used. These are, as shown, 10 in. in length, sufficient to contain two burners, one of which is inserted in either end, the support remaining on the outer side of the roll. The ends of the roll or tube are capped, and the burners, so protected, can be sent to their destination, by mail or express, with entire assurance of safe carriage. When a burner so treated is wanted for use, all that is necessary to restore it to its former ready-for-use state is to fire the coating, which will burn off in a few seconds, when the burner is in condition for efficient service.

But, on examining the burners recently, and testing their flexibility when not coated as above, it occurred to me that the burner, in its improved condition, as now made at Gloucester, N. J., could be safely carried without this treatment. I was aware that very able gas experts had pronounced such a thing impossible, but in my profession orthodoxy is not expected, and accordingly I suggested to the General Manager of the Welsbach Company, from whom I have this generous supply of burners, that I should like to attempt this impossibility. He replied that

such a test was never demanded of the burner and was not necessary in any way, but that I could take as many as I chose to make the experiment with. I selected at random three mantles from which the coating was burned in my presence, and the mantles, as burned and ready for use, replaced in the ordinary tube carriages, these tubes being marked and placed in the box with the rest. The box came with me from Philadelphia and stood its share of the jostling and handling necessary to such a trip, including two carriage trips over the none too even streets of Philadelphia and Sandusky. The marked tubes were opened here by me in the presence of Mr. E. J. King, of Jacksonville, Ill., and the mantles came forth as perfect and as shapely as when they were put in. One of these mantles you see burning here.

I may be permitted to state that I consider this test as showing that, whether the Welsbach, as made in Europe, is as frail as claimed, or not, the mantles made in this country are not of this class.

Nor are the only improvements made those of greater strength or better condition for shipment. A most important improvement is the discarding of the old student lamp chimney, and the employ of the ordinary Argand chimney. The advantages of this change are easily apparent to those who know the earlier history of the burner. It may be noted, also, that, while the burner is doing full duty, the Argand chimney or fixture can be handled without any inconvenience from accompanying heat. This accompanying heat is so slightly felt that this feature is a cause of comment with all who handle the burner during its incandescence. The mantle itself, when the gas supply is turned off, is instantly cool and safe to handle.

Other improvements have been made since the passage of the American patents into the hands of their present owners, but of these it is scarcely my duty to speak. I have told the simple story of the burner as I found it, and it is here to speak for itself.

Like the Welsbach, the Sellon burner uses the Bunsen method of supply. Of this burner we have here only the type which is designated by the term "cone burner." Its shape and material are described as a long-shaped cone of metal gauze, the exact nature of which is not yet made public. The cone is formed with three projections or ribs running symmetrically from its apex to its base.

Strips of metallic gauze, of a width equal to the depth of the cone, are cut into triangular pieces of such a form that when bent, and the edges turned, three of them put together make up the hood. The pieces are then fused together at the edge by the oxyhydrogen blow-pipe, and a very rigid cone is obtained. The Bunsen burner is of a form perfected by Mr. Lewis; an ample length of tube is allowed between the gas and the air inlets and the point of combustion, the result being a quiet and intense flame, not materially affected by the ordinary differences in gas pressure. The light is of a very agreeable color, and the steadiness absolute, as can be seen by the lamp here shown.

The materials of which the cones are made allow an unusual amount of rough usage without injury, a slight touch or pat putting a burner into correct shape when needed. Cleaning the burner, when necessary, is an easy and safe operation, although I do not see how the burner itself will need much cleaning. The fixture and chimney will, and may be handled with impunity, without fearing injury to the burner. In addition to the style of chimney here shown, the plain Argand chimney is also used.

The photometric tests made are said to show an average candle-power of from five to six candle-power to the foot of gas. As to the life of burners, there was, on last Monday, in the office of Mr. E. Stein, of the Siemens-Lungren Company, who holds the control of the Sellon for this country, a burner that had been burning for 360 consecutive hours, and reported by Mr. Stein as having lost none of its original power.

The principal shapes in which the Sellon is presented are the cone, which we have here, the inverted disc, in which the metallic substance exposes an under convex surface, and the inverted disc in the form of an extended shadowless light. There are also other shapes, not so generally shown, and which are simply variations in style only, with no reference to the foot efficiency of the burner.

In this connection, I would also state that Mr. Stein has a new pressure burner, of the type known as the Lewis, but of which I know of no others on this side of the Atlantic. It is claimed that this will give a light of about 300 candle-power, with a consumption of 14 ft. of gas per hour. This yields a dazzling light, and is chiefly designed for use in out-door or exposed positions, without the use of glass globes, as it is not affected by either wind or rain. I have seen no tests of candle-power made.

I had hoped to present a specimen of the Clamond burner, about which many inquiries have been made. This burner has been, according to accounts I have received, considerably modified since its first appearance, and it now requires no artificial air supply, using illuminating gas, upon a system that is more or less regenerative. The correspondents to whom I have sent for sample burners report it impossible at this time to obtain one. The agents of the manufacturers write from London that they have received none. From Mr. John Allan, of the *Gas World*, I have the information that he considers the burner a good one, and that he can distinguish no deterioration in the quality of the light at the end of 200 hours consecutive burning. He also states that the mantle of magnesium oxide can be safely carried if safely packed. This hood, by the way, is shaped like a lady's thimble, somewhat larger. The burner, as near as I can learn, is larger than the illustrations which have appeared, and a full sized chimney is used. One contract has been closed in London, by which a responsible party there binds himself to take 100,000 of these burners within a year, under terms that fix the price of the burner and immediate fixture at from 15 shillings to 20 shillings. These burners are to be paid for, under guarantee, whether sold or not. I mention this fact to show that some few at least on the other side are taking interest in the future of incandescent gas lighting. This burner is said to be popular in France, its original home, but we hear of no installations on any kind of commercial scale. There have been a few, very few, of these burners brought to this country, and I have not been able to find one, though a few days ago I was told that in one instance, the only one under my informant's notice, the candle power fell far below the four to five candles per foot claimed for it. In this instance the illumination was very imperfect, though careful adjustments were made, and finally the gas was left on through the night in the hope that something would turn up. What did turn up would have satisfied Wilkins Micawber. On opening the room in the morning the mantle and chimney were found encrusted with carbon to such an extent that it was not thought worth while to attempt to clean the former. This may have been an unusually imperfect burner.

Of the incandescent burners for especial use with fuel gas, there are in this country the Fahnehjelm, Stewart, Lowe and Lungren. I place the Fahnehjelm in this class because, though the claim is made that it is adaptable to the use of ordinary gas through a Bunsen, it has not been so used upon any commercial scale, nor in any experiments of which tests have been furnished me. I am informed, however, by parties who have no interest in the burner, that it can be so used with satisfactory efficiency. The Fahnehjelm comb, with its little pencils of magnesium oxide, is fairly familiar to perhaps the majority of members present. This burner has been in use for several years at Essen, Germany, and the different papers read at meetings of European associations uniformly state that they give satisfaction, both as to light and life. Essen tests, made some time since, show the following:

| Consumption. | Ignition Pressure. | C. P. | C. P. per Cu. Ft. |
|---|---|---|---|
| 145 liters. | 2 in. | 16.2 | 3.1 |
| 152 " | 2 in. | 18.0 | 3.3 |
| 164 " | 2 in. | 24.0 | 4.0 |

28.31 liters = 1 ft.

Tests made November 16, 1885, at the Novelties Exhibition building with Lowe fuel gas (average of 20 observations):

| Consumption. | Ignition Pressure. | C. P. | C. P. per Cu. Ft. |
|---|---|---|---|
| 5.64 ft. | 1.5 in. | 16.88 | 2.99 |

Tests made at New York city:

| Consumption. | Ignition Pressure. | C. P. | C. P. per Cu. Ft. |
|---|---|---|---|
| 6.6 ft. | 1.3 in. | 23.0 | 3.48 |
| 5.5 ft. | 1.5 in. | 21.9 | 3.98 |
| 5.6 ft. | 1.0 in. | 19.6 | 3 50 |

Among the claims made for the Fahnehjelm burner are: "Its complete adaptability to all purposes for which artificial light is ever used; that it can be applied to any fixture in any place where an open flame of illuminating gas will burn; that it conforms itself without coaxing to any position or use; that it will act without impairment or difficulty at any angle, up or down; that the pureness and steadiness of its ray make it peculiarly pleasant and easy to the eye; that its truth in dealing with colors commends it with great effect to many uses which cannot be served by the best illuminating gas or by any form of electric light; and that its utter cheapness to the consumer lends it that important power of recommending itself which inheres to anything that increases quality and minimizes cost."

Under recent date, the General Manager of the Fahnehjelm Company writes me as follows:

"Up to this time we have confined our business of supply to such limits as would enable us to entirely satisfy ourselves at every point upon every question that could arise as to the usefulness of the system. A business of manufacture had also to be established on a scale sufficient to insure us against shortage in supply. Both these considerations having

been met, we are now about to install the system in some twenty places, contracts for which have been made since last autumn.

"The guaranteed life of our combs is 100 hours of burning. We have never made any that were materially impaired by that amount of use; but 100 hours of efficient service is enough to reduce the cost of light to less than five cents per 1000 ft. of gas—the combs costing the company using them $3 per 100, and the company charging consumers a slight advance upon that price where any charge at all is made. It is urged that companies can better afford to give them to consumers as an encouragement to the use of gas for fuel. The fixtures by which the comb is held over the flame, although somewhat elaborate, do not exceed in cost to the company's licencees the sum of $10 per 100. This fixture is permanent. It need not be changed until the pendant, bracket or lamp, of which it becomes a part, is used up. The first cost, therefore, of attaching a Fahnehjelm comb, cannot exceed 15 cents; and renewals of the combs themselves cannot exceed five cents each, at intervals depending upon the frequency with which the gas is lighted, and the number of hours per day during which it is burned.

"The light furnished we guarantee at the estimated rate of three candles per foot. I have never known any photometric test to fall below that point; but regarding this question I prefer you should take a reading made by a disinterested third party. Mr. J. R. Smedberg, of Baltimore, made a measurement last January under conditions, exceptionally unfavorable to us. A transcript of his calculation I enclose herewith."

The tests made by Mr. Smedberg bear out the claims made for the photometric standard of the burner. My own tests of this burner—the only ones I made—showed from 20 to 22 candles, with a 6-ft. consumption, under 1.5 in. pressure.

In this connection, I have received, since here, a letter from the manager of the fuel gas works at Jackson, Mich., where the Fahnehjelm burners are used, in which the writer says:

"The burner or comb has been greatly improved since its first introduction here, Dec. 21, 1887, and to-day I have before me one burning 5 ft. per hour, that has burned 4 hours per day for 31 days, and, in addition, had burned continuously 184 hours—a total of 308 hours. It is still burning with as much apparent brilliancy as when first lighted."

In the same letter the manager refers to the printing of photographs by the aid of this burner, and says: "As an illustration that this can be accomplished, I wish to state that by the use of one burner and without the use of a light concentrator, in a perfectly dark room, I produced a print nearly as distinctly as sunlight would do it."

We have specimens of the Fahnehjelm here for inspection by those who are not familiar with the burner.

The Stewart burner, of which we have a specimen here, is composed of little tubes of magnesium oxides, arranged, as shown, nearly vertically, and in the general form of a circle, around the base of which, on the outside of the tube circle, may be seen the fine apertures of an Argand burner. The heat impinges directly upon the tubes and produces a light, the photometric tests of which are claimed to show 5 candles to the foot. I have, in company with one of the best of experts, tested the burner, and found the power to be somewhat lower than this, but at the time of our tests the quality of the gas supplied was not up to the ordinary standard of the gas used for this purpose.

An advantage claimed for this burner is that the tubes are separate from each other, and loosely placed; so that, if one or more should be accidentally broken, they can be replaced without any further loss. I may add that, while the specimen here shown possesses this advantage, it does not show all the later improvements of the burner. The burner is being further developed, and I found it impossible to secure one of later make than that shown.

The Lowe incandescent burner is made of wire composed of platinum, iridium, and other metals, and while its particular forms vary considerably, its general shape is that of the horseshoe shown in the specimen we have here. This burner is the form most commonly used, and the one which, I think, in its various sizes, yields the best results. The latest photometric tests of the Lowe, of which I find official record, were those made at the Novelties Exhibition in 1885, and at which time a series of eight tests resulted as follows:

| Consumption. | Ignition Pressure. | C. P. | C. P. per Cu. Ft. |
|---|---|---|---|
| 9.69 feet. | 2.25 inches. | 12.85 candles. | 1.33 candles. |
| 8.31 " | 2.37 " | 10.88 " | 1.31 " |
| 7.90 " | 2.50 " | 12.24 " | 1.55 " |
| 6.70 " | 1.75 " | 8.48 " | 1.26 " |
| 6.70 " | 1.00 " | 8.41 " | 1.25 " |
| 5.58 " | 3.25 " | 9.94 " | 1.78 " |
| 5.10 " | 1.50 " | 6.85 " | 1.34 " |
| 3.96 " | 2.00 " | 5.49 " | 1.39 " |

These tests make an average of 1.40 candle power per foot. In my record of these tests I find the following note:

"From these figures the judges deduce the fact that, compared with 17-candle gas at $1.50 per thousand, the fuel gas, to be as cheap for illuminating purposes, must sell for a little more than 61 cents per thousand; or, in round terms, at two-fifths the price of such gas."

Argument from this basis is an easy matter to-day, for the advocates of fuel gas and incandescent gas lighting.

In connection with this burner learning that Mr. L. P. Lowe had made later tests, I wrote him for them, receiving the following:

"Relative to the tests of the incandescent burner, I am sorry to say that I have no memoranda of same at hand here. As you know, they were made at Norristown something like three years ago, and the records of the tests are in my desk there now.

"If my memory serves me right, however, they were about as follows:

"Duration of trial, 100 consecutive hours; candle power at start, 18.1. I think I made four readings 25 hours apart, but of course cannot remember what the observations were at each time. I think the averages were about as follows: Candle power, 17.6; gas consumed per hour, 9.1 ft.; burner lost in weight, two tenths of one per cent.

"The tests were not very satisfactory, inasmuch as the gas I had was of varying quality. As you know, it was not purified, and contained sulphuretted hydrogen and carbonic acid, which, had they been removed, would have caused an increase of light, and decrease of gas consumption. The burner was our No. 3, and amongst the first made.

"It is only fair to say that since that time considerable improvement has been made in the burner, but I have never had an opportunity of repeating my observations, as the necessary 100 consecutive hours have been scarce when I have been in Norristown, since then. Had I my photometer, meters, gauges, etc., here, I could easily go through it, but I have not. One hundred *consecutive* hours is a severe trial, but I would not think much of a shorter one, and, in my judgment, it is equivalent to 500 hours' burning.

"While my memory may have misserved me in this instance, I opine I am not far wrong, and you may use this information if you wish, provided you use it all."

The Lungren is the latest of the incandescents which has come to any notice in this country. This is the invention of Mr. Chas. M. Lungren, whose regenerative lamp is known and used over the continent. Mr. Lungren had promised to send me specimens of his most lately made burners, but he writes that press of work has prevented his perfecting the desired changes in time. Important changes have been made since the burner was first devised. The burner is composed of filaments or threads of refractory earths, and, as I understand, is intended for use with fuel gas. I am informed by parties who have seen the burner tested that the candle power development is satisfactory, reaching higher grades than some well-considered burners now in the market. Beyond doubt, we shall hear more of this burner during the coming year.

As before stated, it has not been the purpose of this paper to enter into discussion of the pros and cons of the subject of incandescent gas lighting. But I cannot fail to note a remark made to me to-day by one of the brightest of Ohio gas men, to the effect that he wanted to wait and watch the outcome of incandescent gas lighting for a while before he decided whether or no to introduce electric lighting. He thought it would pay to wait. Others are of the same opinion. The question is growing, and the little cloud that was, not long since, less than the size of a man's hand, is becoming of quite respectable size. Will it bring us the long-desired rain?

*Discussion.*

Mr. Alexander—Can you tell us what these burners cost?

Mr. Graeff—I cannot. I do not think the Company has arrived definitely at the price at which they expect to put them.

Mr. McMillin—I have had considerable correspondence, some talk, and a little experience with reference to the Welsbach burner. Probably the Gas Company here could not buy from the Welsbach Company at all, for the territory has been sold. The parent Company sell out territory in two or three States; the purchasers of the right then organize local companies in the cities, and sell the burners to consumers. The present market price, including chimney, Bunsen burner, mantle, in fact all the paraphernalia, would be probably about $2.50. The mantles would cost from 15 to 20 cents, the exact figure depending probably upon the policy of the local company. I have had in my possession for some time a number of these burners, all of which (with one exception, perhaps) have given from 8 to 11 candles per foot of gas. Probably some of you have seen the Welsbach burner at other places. Here we have but the one color. The light from one variety is as white as snow, and that

style is sure to capture the eye of one who sees an incandescent burner for the first time. It was so in my case and equally so with those who accompanied me to Chicago for the purpose of examining the light. When, in my laboratory at Columbus, I showed the burners to our officers and directors, they all decided that the white burner was *the* burner; that none of the others would at all meet the requirements. The ones which they pronounced against were about like the sample shown here, but perhaps burning under more favorable circumstances. The Welsbach Company, however, did not speak so favorably of the white burner. They did not think the general public would like it so well in the end. They said it was too bright, too brilliant, and not as good as the other. Later on, and to my great astonishment, when I made a photometrical test of the yellow mantle, I found it yielded, from a consumption of 3 cubic feet of gas, the light of 42 candles—I might explain we were on that day testing some cannel coal, and that we do not send out a like kind of gas all the time; whereas the white mantle, which had so strongly attracted our fancy, gave only 13 candles. It shows how easily the eye can be deceived as to the lighting value of a lamp or burner. The ordinary yellow burner is white enough—it looks white enough when the other is out of the way, although it appears quite yellow when directly compared with the other. I have tested the burners several times a day for many days, but am not yet at liberty to give you the results. I will say this, however, that the best of them develop far more light (often twice as much) when burning 3 feet of gas than is obtained from a lava tip consuming 6 feet.

Mr. J. Gwynn—What is the lowest consumption rate in the tests made by you?

Mr. McMillin—I tested them at many rates, often going down to as low as 2 feet, but my records were usually obtained on the basis of 3 feet per hour.

Mr. J. Gwynn—Do they show as well with natural gas?

Mr. Graeff—I am informed by the Company, and from independent authority as well, that they act very satisfactorily with natural gas. As I remember the figures, a Welsbach burner, consuming about 1½ cubic feet of natural gas, gave illumination equal to that shown when it was consuming over 2 cubic feet of manufactured gas. Perhaps Mr. McMillin can correct this statement. I gave it as I got it from an outsider. The result about tallies with what I was told at the Company's office.

Mr. McMillin—I have seen it tested with water and with fuel gas, and have also seen some most excellently kept records of tests at which I was not present. They have made an improved or special burner for consuming natural gas. About 10 days ago I was invited to witness this new style of burner tried with natural gas, but it was not then convenient for me to attend. I think the trial was made with 1.9 cubic feet of natural gas per hour, supplied under 6 inches pressure; and while I cannot positively state the results, I believe they were much superior to those obtained in the fuel gas trial mentioned by me a few moments ago.

Mr. Christian—How about the water gas test?

Mr. McMillin—I believe the water gas trials gave the best results of any tests at which I was present.

Mr. Graeff—Do you know the pressure rate under which water gas was consumed?

Mr. McMillin—I do not. My experiments were made at a pressure of about nine-tenths of an inch.

Mr. Graeff—I could not determine the pressure carried when I saw it tested with water gas; but, judging from ordinary burner tests made on the same quality of gas, I should say the Welsbach test was conducted at a lower rate. Also, that the pressure was less than had been used with another incandescent burner with which I previously had had some little experience.

Mr. McMillin—I will ask Mr. King if a pressure gauge was used in the test at Chicago on natural gas?

Mr. King—I am not positive.

Mr. Cosgrove—I have seen it tested in Chicago with what they call a "mixed" gas—a mixture of all the gases made at the different works.

Mr. Lindsley—I saw a Welsbach burner using coal gas and natural gas under a pressure of about 1.2 inches. The result could only be judged of by the eye, for there was no other method of estimating at hand. Apparently the natural gas gave the better light.

Mr. McMillin—The composition of natural gas is such that I would expect better results from it than from coal gas or from carburetted water gas; and the composition of uncarburetted water gas is such that I would expect yet better results therefrom.

Mr. J. Gwynn—From tests that I have seen, the Welsbach burner yields a much better light from the consumption of 3 cu. ft. of natural gas than when consuming 5 cu. ft. of manufactured gas, either coal or water.

Mr. Page—We are familiar in this country with the Lungren type of regenerative burner. The Lungren type is known in Europe by various names, according to the character of the lamp, either as the Bower, Wenham, Clark, etc. The sales on the other side of the water of such lamps are very extensive indeed. The Wenham Company alone paid a dividend last year of £24,000 sterling on a capital of £100,000, which gives you an idea of the enormous business that must have been done in the regenerative type of burner. It seems to me that incandescent burners, and particularly the Welsbach, must be improved in various ways before they can be generally adopted. As it is now, it is not pleasant to the eye. The form is not attractive. It must be changed in some respects in order to cause the illumination from it to become attractive. Colored globes ought to enhance the light from a Welsbach burner, in fact, when so encased, I think the Welsbach light is fully as attractive as the electric incandescent light. Whether it is to be a financial success has yet to be demonstrated. Thus far the American business of the Welsbach Company seems to have been in the direction of selling State and county rights, rather than in selling burners. The faith of the Company, however, is shown by their purchase of a very large property at Gloucester, New Jersey, and where they are expending a large sum of money in putting up an extensive manufacturing plant. I suppose the burner will be on the market within the next 60 days. They have employed a large staff of scientific men. In fact, I suppose there is hardly another industry in this country which can claim to have so many scientific men in its service. In Vienna (where it was first brought out by Dr. Auer), the Welsbach burner is largely used, as also is the case in London. In Paris it has made but little headway. Here the parent Company are making many improvements in the device, and I think eventually they will make a success of it. I believe it is bound to be used very largely. Two other types of incandescent gas burners now in the European market will be soon on our market. The one from which the Welsbach may anticipate most competition is known as the Sellon-Lewis. The metal platinum is used in this, which I believe will prove to have greater staying qualities than the Welsbach material. The Sellon Company, who control the burner, are the most extensive manufacturers of platinum in the world. The burners, which are being now marketed, are giving great satisfaction. Their light is said to be many times that of the Welsbach. Then there is the Clamond burner, which I believe is chiefly composed of magnesia, although in a widely different form from that followed in the Volckmar type of burner. A Company to handle the Clamond was exploited, within the last six weeks, in London, and the stock (something over £50,000), was taken up immediately. This could not have been done in London unless the burner had merit. The Volckmar yellow flame burner I do not believe in; owing to its great fragility it breaks easily. The successful burner must be one which does not need to be replaced very often. I do not care how good it is, consumers of gas do not want to be put to the trouble of constantly replacing their burners. You can appreciate how troublesome a burner might be if it should break at a time when a party was being held, or in the case of the lighting of a public place. You must have something at least fairly permanent. Now we know that not over 7 per. cent. of the possible lighting of gas is obtained by the instrumentality of a good flat flame, whereas the Welsbach proprietors claim to utilize from 12 to 15 per cent.; and regenerative gas burners (of which the Lungren is a type), have three times the efficiency of the best flat flame burner. When you who are interested in either coal gas, water gas, or natural gas, know that in the near future you can hope to attain the maximum inherent lighting efficiency of your product, is there any fear as to the future with respect to your position? Not at all. You are going to light the world.

Mr. McMillin—Mr. Page speaks of the possible breaking of the incandescent burner during a party, or at any other time when a goodly company is on hand, either at home, in a theatre, or elsewhere. Having thought of this myself, I experimented in a different place—in a bedroom which contained but one light; and where, if the mantle became fractured during the night, someone would have to hunt up either a candle or an oil lamp. Suggesting that possibility to a certain gentleman, he pulled a reamer down through the burner, splitting it from one end to the other. I thought it burned better after that was done than it did before; he broke off its top, but it

gave a fairly good light then; he then smashed it down, flat into the flame—a mass of ashes—and it probably still gave as much light as a flat flame burner would. There is, therefore, no probability of your ever being left entirely in darkness by it; for, even were you to break it all to pieces in the chimney, there would be light enough from it to enable you to go to bed. I do not want to influence any one to invest money in this burner, for I am not far enough along myself to say that I wish to buy territorial rights or to invest money in it. I think I know now the mantle will last for 80 to 100 hours. After a while I shall know whether it will last 200 or 300 hours; but I do not know so now.

On motion of Mr. Butterworth, a vote of thanks was passed to Mr. Graeff.

Mr. Moses Coombs, Jr., of Youngstown, now related

## AN EXPERIENCE WITH CHOKED STAND-PIPES.

*Mr. President and Gentlemen of the Association:*—I suppose in the many vocations of men different from that of our own, difficulties are at times to be met and contended with which annoy and perplex those who are involved with the duties connected therein; and I have reason to believe that the chosen profession of the gas man of to day receives its allotted share of the same.

You will no doubt coincide with me in saying that very few flowers are found strewn in our pathways; and the future has yet to reveal when we are to enjoy our beds of roses.

Among the many hard problems to solve, and the annoyances or vexations with which we have to contend, let me, if you please, gentlemen, call attention to just one of these that came in my pathway. We distinguish it from others by the name of choked ascension or stand-pipes. Thinking an outline of an experience with them might be interesting to some, I involved myself in promise with our worthy Secretary to give the same. I had no sooner stepped from the ranks of fitter and meter inspector for our Company, to that of the Superintendent, when I was confronted with this nuisance. My first experience with this trouble dates back to the winter of 1868, while running two benches, of three clay retorts, each 14 ins. by 22 ins., by 9 feet long, provided with 5-inch stand-pipes.

The summer following the above date this nuisance seemed to have vanished. This change was very acceptable, indeed. Account for it I could not. It was a puzzle to me at that time, because I could not determine any good reason for the changed mode of working, looked at from the standpoint that there was no change made whatever in the bench settings and their connections; but mark this: I changed their work from a heavy to a light run, decreasing the heat in proportion to the decreased weight of charge per retort—this being done on account of a lesser demand for gas. In working this way I found little or no trouble whatever in making three to four thousand feet of gas, per retort, per day. As everything seemed to be running smoothly in this way of working, and it being in the summer, with a season of small output, I gave the matter very little attention then.

The winter of '69 and '70 brought back to us—it seemed with renewed energy—the old trouble. I never shall forget that winter, and the combat we had with the pipes, if I live to be 100 years old.

The choking of stand and bridge-pipes would average six to the retort per day. We always looked for a stopped pipe in about ten minutes after the charge went in, and we generally got it, too, although we were very particular in clearing that pipe well before the retort received its charge. After we had gone through this severe test of freeing the pipe of its obstructions by using the reamer below and hot rods above, we considered ourselves very fortunate if that pipe did not call us back again before the renewal of its retort's charge. I have known it to occur almost as soon as our backs were turned, so to speak; and, if so, we might then look out for a harder dose than ever, for, in all probability, it would be the bridge-pipe that we would have to contend with. Such being the fact, it was "Hurry up, men; mount that hot bench with your hot rods—burn out, ram out, any way to get out that obstruction in the bridge! It must be done! Stand up to it; there, in that suffocating smoke and hot gas issuing from the open retort below; and don't run away from it until you have cleared the obstruction or are relieved by your fellow workmen."

I began to feel discouraged with such work going on each day. I was already disgusted with it and was thinking seriously of getting out of the trouble by handing in my resignation and going back to the anvil, where I had previously been before entering the service of our Company. *There* I enjoyed peace and happiness; *here* I had nothing of the kind. But on reconsidering the matter, such retreat seemed to me like a cowardly act, and my conscience would have branded me a "deserter" if I took this way of getting relief. I finally concluded to stand to my post, to fight it out on that line all winter and make it "go" or blow the concern up. I am glad now that I so decided; for, in the latter part of this conflict, an incident occurred which brought to light the cause of this trouble and afterwards a remedy for the same.

It happened this wise: One morning after taking the index of station meter, I noticed our make of gas for the preceding 24 hours had been unusually low. I started out to investigate the matter and found one of the retorts working at low heat, and that its charges, although being drawn at the regular time, were but partially burned out. I ordered the weight of this retort's charge reduced. We worked this retort for a few days in this manner with an orange heat, while its mate was working at nearly a white heat. We kept punching away at the stand-pipe as usual on the highly-heated retort, but the one where the heat had been reduced did not need the attention we had previously given it because of the clogging of its stand and bridge-pipes. After seeing the great difference in the working of these two stand-pipes, side by side, I immediately set to work and cleared the obstruction in the bench settings, which brought the heat and working capacity of this retort equal to that of its mate. By so doing I also brought back the stopped pipes, just the same as if nothing had happened. The scales fell from my eyes, if I may so express myself, and I commenced to see and to understand the causes of all this trouble—that is to say, so far as the Youngstown works were concerned. I drew my conclusion in the matter and attributed it to the high heats.

You have noticed, no doubt, that this experience had taken me through the running of retorts with both low and high heats, without making any comments as to the advantages, except the effects produced on the ascension pipes.

In reference to this let me say; comparatively speaking, I found that the retorts working with low heats favored us with clear pipes, but unfavorable in yield and capacity, whilst high heats favored us with an increased yield of gas from the coal, and a largely increased capacity, with the disadvantages of contending with stopped pipes. After comparing the results, together with the advantages and disadvantages of retorts worked under low and high heats, I desired very much to continue the year through on the high heat system, as I would have a very much better showing at the end of the year for my Company than I previously had by running low heats part of the time; but the annoyance of having stopped pipes to contend with lessened that desire very much, and unless I could evolve some good way to get rid of the nuisance, it would be doubtful as to my taking that step. I began, then, to think about the matter, and the idea occurred that if I could change the heat of retorts from a low to a high one, without changing the temperature of stand-pipes as worked with a low heat, I might find some relief. In order to carry out this idea practically, in my first plan I surrounded the stand-pipe with a concentric cylinder, or jacket, closed at the bottom, through which a current of cold water was kept flowing during the time occupied in carbonizing the charges. The object was to prevent the walls of the stand-pipe from becoming highly heated, as was usual with retorts worked at high heats, their temperatures causing the tar to become concentrated and thickened to a pitchy consistence, caking the walls of stand-pipe in such a manner as to completely choke it up. This plan gave good satisfaction and I arranged all of my pipes in like manner, after which I had no trouble with choked stand-pipes when running the retorts at a high temperature.

The objection, however, to this plan, was the manner in which the apparatus was adapted and erected.

First, it was complicated, being a pipe within a pipe.

Second, too much care had to be exercised in order to have all joints made absolutely gas and water tight, and remain so under the strain of contraction and expansion at bell of mouthpiece.

To overcome these objections, and, at same time, to get equal results, my second plan consisted in having a vessel or reservoir cast on top of mouthpiece, equal to the width and breadth of the same. This has about the same effect as the double stand-pipe, in reference to its keeping the pipe free, or from becoming clogged. There is no trouble in putting this up, for when you bolt the mouthpiece on retort this arrangement is completed.

This subject has also attracted the attention of our brethren across the water; for in one of the meetings held by the British Association of Gas Managers a few years ago, Mr. J. Somerville, of the great Dublin works, where four millions cu. ft. of gas per day is

made, says: "They are a constant source of anxiety in the retort house, as they are also a constant source of expense and waste." Mr. Hodgson Jones and others claiming they had overcome this by using very large ascension pipes, Mr. G. Anderson rejoined, "That this made no great difference. He had had 7-inch pipes stop as well as 4-inch, and, whatever the size might be, it was simply a question of longer or shorter time before the pipes became stopped. Under favorable circumstances he had, though with misgivings, used 3-inch pipes, but found them perfectly efficient, which confirmed his belief that it was not a question of size at all, but of heats."

This plan that your attention has been drawn to is free to any and all who wish to make use of it. The results that you may obtain would, I think, prove satisfactory. I have reason to believe this, because, after adopting this plan of keeping the stand-pipes at a uniformly low temperature, the inconvenience and annoyance heretofore experienced with stopped pipes passed away, unknown at the present and a record of the past.

*Discussion.*

Mr. Cantine—I have had an experience similar to that of Brother Coombs, but it never occurred to me to get up anything like a water jacket. Our works were built by the Kerr Murray Manufacturing Company, of Fort Wayne, Indiana. Mr. Murray, who was a very good workman himself, attended personally to the greater part of the work of putting up the holder, but had to go away about the time the bench castings arrived. The men who put them up for him did not know "which was which," or how they were to go. The stand and bridge-pipes were installed just the opposite way from the proper way. The pitch of the bridge-pipe was towards the end of the mouthpiece, and from the main. Well, the arrangement worked first rate. We did not have any trouble from stopped stand-pipes, etc. The next time we fixed up a bench (in the meantime I learned how other people did), I told our men that the pitch of the pipes ought to be towards the main. We put them up on the new bench according to my notion of the proper plan, cooled off the old bench, and altered the pipes to it. Then we were in for a picnic. We had to clean out the stand-pipes all the time. Finally, to avoid further trouble, we put them back "wrong," have used them "wrong" ever since, and never have had a choked stand-pipe since. The theory of it is this: The soot mixes with the tar, and drops right back on the mouthpieces. We find a quantity of it there every time we "pull" a charge. That has been our experience. We have not cleaned the stand-pipes in a year.

Mr. Day—I think our Secretary has had some experience in this line.

Mr. Butterworth—I intended to tell you about some of our troubles at Columbus, where we have had our full share of stopped stand-pipes. We have taken out masses of pitch which were fully equal to the diameter of the stand-pipe from whence they came, and very nearly half as long. We called them "black babies." Where we used the anti-seal dip we have been troubled with stoppage, and it forms a seal in the movable dip pipe. It accumulates, forming pitch, at first, and then gradually hardens until we find the lever which operates the dip moving harder and harder, until finally we cannot move it at all. Then we are obliged to take down the pipes and clean them out by hand. Recently, though, we hit upon the plan, when they got into as bad shape as that described, of building a fire around the stand, and even dip-pipe, to melt the tarry pitch, which, as it softens, flows out. The pitch that forms in the pipes is as hard as any that Mr. A. T. Perry ever made. It was as hard as a rock.

Mr. Lindsley—Before we adjourn permit me to say I have a letter here which has direct reference to what the Secretary mentioned about the action of sealed and unsealed dip-pipes. I will not mention any names now, but the writer says: "The formation of carbon in retorts is very slow, and stopped stand-pipes seldom occur." He uses no seal. My experience is that of the gentleman who wrote me.

The convention then adjourned.

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SECOND DAY, MARCH 22—MORNING SESSION.

The second day's proceedings were opened by Mr. George Shepard Page, of New York city, who read the following paper on

PURIFICATION IN CLOSED VESSELS.

*Gentlemen of the Ohio Association:* It gives me pleasure, in compliance with the invitation of your energetic Secretary, to take a minor part in your annual convention.

The subject which I have chosen to write upon is one that is now exciting the attention of a large portion of the gas engineering fraternity in Europe and America; and all will admit that one of the most important improvements which can now be introduced in gas making is a system by which the dangerous and expensive lime and oxide purifiers shall be displaced. It is well known to chemists, especially to those who are or have been identified with gas manufacture, that coal contains those very impurities which, if they could be presented to the gas when being passed forward from the condensers, would entirely eliminate all the impurities in such gas.

Vast sums of money have been expended in the endeavor to elucidate this problem, and I think I am in a position to say that this has been finally accomplished, and that two systems are about being offered to the gas fraternity of the world, either of which is pronounced effective.

For two years past a process invented and patented by Mr. C. Claus, of Birmingham, England, has been operated in connection with a portion of the gas production of that city. All the carbonic acid and all the sulphur and cyanogen compounds are removed, except about 10 or 11 grains of sulphur per 100 cubic feet of gas. The chemical agent used is concentrated ammoniacal liquor.

By an ingenious system of washers, pumps, and stills, a given quantity of ammoniacal liquor is rapidly presented to the incoming volume of gas. Its impurities are transferred to the ammoniacal liquor, and the gas is liberated to go forward to the gas holder in the condition just mentioned.

This operation is not only economical, in being less costly as well as less dangerous than purification by ordinary modes of using lime or oxide of iron, but all the sulphur is recovered in the form of pure brimstone, or flour sulphur.

By this means another residual of coal is, for the first time, utilized. When we consider that ordinary gas coal contains from 2 to 5 per cent. of sulphur, which means from 50 to 100 pounds per ton; and when we know that sulphur costs, laid down in New York from Sicily and Italy, $20 to $25 per ton, you will at once see that the yield from sulphur will be a revenue of 40c to $1 per ton of coal carbonized. From this must, of course, be deducted the cost of treating the gas, the cost of fuel, and labor of redistilling and concentrating the ammoniacal liquor and driving off the sulphur, and the cost, per ton of coal carbonized, for royalties. But with these deductions I am sure that there is an additional net yield of 25 cents per ton of coal carbonized.

The results gained at Birmingham have been of such a satisfactory character, that the Belfast (Ireland) Gas Corporation contracted for the necessary plant for their new works, which are being constructed there. These will be completed the present spring. Within six months actual results on a large working scale will, without doubt, be published to the world. I am quite confident that they will be far better even than those gained in a smaller way at Birmingham.

But another bright and experienced and intelligent gas engineer has been engaged for several years in working out this same problem. I refer to the distinguished William Young, Esq., of Scotland, the father of the great paraffine oil business—who is largely interested in recovering ammonia and tar from the distillation of shale used in the manufacture of paraffine oils, who is widely interested in gas manufacture, and who is one of the ablest, if not, perhaps, the most prominent man in this direction at present living. He has patented a process which, in many respects, seems to be simpler and less expensive than the "Claus." It is now being worked out, and in due time the results will be known here as well as in his own land.

In addition to the many economical advantages of such a revolution in gas purification is the freedom from danger to life and property which always menaces the gas engineer, and the men who are employed in opening, discharging and refilling the purifier boxes. Some of the most terrible accidents of modern as well as earlier times in the history of gas making have come from explosions through the admission to the air of a greater or less quantity of gas contained in each purifier box, and its subsequent contact with fire.

Many of my hearers will recall the death of Mr. James B. Blake, at one time Mayor of Worcester, Mass., and also President of the Worcester Gas Light Company. His death was caused by an explosion in the Worcester Company's purifying house. Others knew Mr. Pratt, for many years Superintendent of the St. Louis Gas Light Company, who was killed by a similar explosion.

An examination of the files of the American Gas Light Journal

shows the following list, which, of course, is only partial, of the casualties due to this cause:

On February 13, 1881, a part of the Bucyrus (Ohio) gas works was destroyed by an explosion caused by escaping gas in the purifying room. Loss, $1,200.

On January 25, 1883, an explosion occurred in the purifying room of the Lansing (Michigan) gas works, which nearly wrecked the building.

On October 31, 1884, much damage was caused in the Milwaukee (Wisconsin) gas works by a gas explosion in the purifying house. Damage $5,000.

By an explosion at the Sharon (Pa.) gas works, in January, 1886, Supt. D. R. Shiras was quite seriously injured.

An explosion in the purifying room of the Kansas City (Mo.) Gas Company, on the 9th of December, 1885, caused a heavy damage to the building and machinery.

Supt. O. C. McCurdy, of the Mankato (Minn.) gas works, came to his death through an escape of gas in the purifying room, on the 26th of April, 1887.

A few weeks later, at the same works, the then superintendent, Mr. J. A. Presley, Jr., came to his death in exactly the same manner.

Then, for a moment, think of the enormous annual waste of gas. I believe you will all agree with me that if you could individually have in money the value of the gas which is thus distributed without the intervention of the gas meter, the income of a Gould, an Astor or a Vanderbilt would be realized.

In the present history of most of the gas undertakings in this country, with the prices approximating $1.25, the dividends are now almost exclusively paid from savings in gas manufacture; by the use of regenerative furnaces and other improved appliances, by the increased income from the sale of residuals, and by that other most important saving, reduction in leakage and unaccounted-for gas.

Competition with the electric light and other modes of supplying artificial illumination, heat and fuel, compels every gas manager to examine constantly and carefully the merits of each new apparatus which promises to save even as much as one cent per thousand cubic feet. The necessity for this will be illustrated by the aid of your pencils in computing what one cent per thousand cubic feet must be in the present production of gas in the United States.

The carbonization of bituminous coal, the carburetting of gas from anthracite coal and coke together, probably represents an employment of 3,000,000 tons of coal per annum. At 10,000 cubic feet per ton of coal, we have 30,000,000,000 cubic feet of gas, which, at one cent per thousand, would amount to $300,000, which would be the interest, at 5 per cent., on $6,000,000, or an interest on the probable gas capitalization ($100,000,000) of three-tenths per cent. per annum.

Of course, within the limits of a paper like this, and considering the time at your disposal to-day, it is impossible to properly refer to all the methods now being agitated for the cheaper and more efficient purification of gas. I may, however, call your attention to the Cooper Coal Liming Process, the Hawkins plan for revivification *in situ*, and Brin's Oxygen Process, all of which are more or less meritorious.

*Discussion.*

The President—Perhaps Mr. Page would offer some description of the machinery that he speaks of.

Mr. J. Gwynn—I also ask a statement of the cost of the apparatus for different-sized works.

Mr. Page—It would be difficult to describe the apparatus without drawings, which I have not here. My statement was collated largely from what has appeared in the foreign gas journals, and from correspondence with Mr. Claus and Mr. Young. The simple statement that the apparatus is a succession of washers, pumps, etc., may explain it sufficiently to give you an idea as to what is employed to take the place of the ordinary purifier boxes. I am unable to answer Mr. Gwynn's question as to cost of apparatus, for the plan is as yet only in an experimental stage. At Birmingham, under the constant supervision of Mr. Charles Hunt, Chief Engineer of the Birmingham Corporation Gas Works, and of his able associate, Mr. Henry Hack, the Claus plan was carried on by the Company, which proposes to operate it. Mr. Hunt read a paper before the 1887 meeting of the Gas Institute, in which he indorsed very fully the process as successful. His figures indicate an income, allowing interest on cost of apparatus, and charging up accurately the value of fuel used and for the labor employed, of not less than 25 cents per ton of coal carbonized. As stated in the paper, the system of Mr. Young is said to be less expensive, in that it requires less apparatus and of a less complicated nature as well; further, that the services of a chemist are not required. The Claus process requires a knowledge of chemistry on the part of the gas manager. Under Mr. Young's system, it is claimed the apparatus is so gauged that, given the quantity of gas to be passed, the chemical agents used will or can be determined by the ordinary gas manager.

Mr. Faben—I would like to ask Mr. Page if he can tell us what chemical reaction takes place in the process, and how the different impurities are collected and disposed of.

Mr. Page—I am unable to state, from memory, what the chemical reactions are.

Mr. Faben—Can you state them in a general way?

Mr. Page—The general way stated covers it—that is, into ammoniacal liquor, concentrated to 80 ounces, is passed a certain quantity of gas, from which by heat had been driven off certain impurities, the ammoniacal liquor bath being intended to catch and remove the carbonic acid, sulphur, and cyanogen compounds which are coming forward. That ammoniacal liquor is then distilled over, whereupon the sulphur passes off in the form of 100 per cent. flour sulphur. It is in fact ready to be sent to market. I think that explains it in a general way.

Mr. Faben—The amount of ammonia to be combined with the carbonic acid has also volatilized, and passed off at a low temperature; but if you could state how those reactions take place, the temperatures at which they take place, and how collected and disposed of, the statement would be very interesting.

Mr. Page—That point alone would require a carefully written paper. Mr. Hunt's paper occupied, if I remember rightly, 3 or 4 pages of the London *Journal*, a large part of which is taken up by just what you ask for. Of course you well understand that the majority of gas managers have not had either time or opportunity to become informed upon this extremely intricate subject of chemistry. Not being so informed, even if the symbols which express the sulphur and cyanogen compounds were stated, they would, under the circumstances, be meaningless. The crucial test is to determine whether the impurities are taken out. To this I answer, yes; without question. Why? because what Mr. Charles Hunt says publicly we may take to be surely right. The next question is, whether the cost of the operation is less than the ordinary mode of purification by oxide of iron and lime. I think there can be no doubt that the new way is the cheaper. The final practical question is, what is the gain per ton of coal carbonized? The answer to which may be placed safely at 25 cents.

It would require a special paper to explain the points to which Mr. Faben refers; and if the gentlemen think that branch of it sufficiently interesting, I will be glad to prepare such a paper for the coming meeting of the Western Gas Association, where I suppose a majority of those here present will also be found.

Mr. Faben—It will suit me.

Mr. Page—I might add a few words with regard to the process of purification in closed vessels. In the gas works at Tunbridge Wells, England, where purification in closed vessels has been followed for four years, the vessels have been opened but three times. This is effected by what is known as the Cooper coal liming process. Roughly stated, this is carried out by adding a certain quantity of lime to the coal as it is being carbonized. The process is steadily extending in England, where some 15 companies have adopted it, although it has met with fierce opposition from some very prominent English gas engineers. Another process is that recently adopted by Mr. J. G. Hawkins, the engineer of the Wigan Corporation gas works. He introduces a fixed quantity of air to the oxide, and thus revivifies the material without taking it from the boxes. His boxes have not been opened for a year. Perhaps the most important of all is the plan now being introduced as Brin's oxygen process. The Brin Company supply gas works with a pure oxygen, a given quantity of which is admitted with each thousand cubic feet of gas. A paper was read on this subject by Mr. W. A. Valon, of the Westgate Corporation gas works, at a recent meeting of the Manchester District Association of Gas Engineers. He has had the Brin process in operation for 6 months, and he indorses the plan very fully, indeed. He says it possesses an advantage over the introduction of air, as under the Hawkins process, in that the least introduction of air causes a reduction in illuminating power; whereas, on the other hand, a system which supplies pure oxygen is furnishing the exact chemical agent needed for revivification *in situ*. A letter received from Mr. Valon three months ago, states that his experiments were not yet concluded, but had been, up to that point, very sat-

isfactory. An editorial on this subject appears in the *Journal of Gas Lighting*, for February 28, 1888, which says:

"The report of Mr. W. A. Valon, published in the last issue of the *Journal*, upon upwards of five months' trial of the oxygen process of gas purification at the Westgate-on-Sea gas works, is a very important addition to the stock of information upon this subject. The report, which was prepared for Brin's Oxygen Company, Limited, the owners of the process, speaks for itself. It is very creditable to this Company that they should have put themselves so unreservedly into Mr. Valon's hands in regard to this matter, especially as we believe it was quite understood that he should be at liberty to publish, for the general guidance of his professional brethren, the results, good or bad, which he might obtain from any trial of the process he might choose to make." It is proper to say here that Mr. Valon ranks with engineers of the Livesey-Somerville-Hunt, etc. stamp; men who are as careful about putting out anything over their names as a bank is in certifying to financial matters connected with its business. Continuing, the *Journal* says:

"Mr. Valon has now told everything; and anybody competent to express an opinion upon such matters may judge for himself of the probable value of the process, as well as of the sufficiency of the test applied. This latter consisted, as the report states, of treating the whole of the gas made at the Westgate works during the past winter; care being exercised to preserve absolute uniformity in the carbonizing arrangements for this period, so that the experiment could be said to have been commenced, continued and ended upon the same manufacturing basis. No exception can be taken to the coal or oxide used, and it may be well to state here that the Westgate works are admirably suited for any experiments of this nature, or, for that matter, for working out any process in connection with gas making on a practical scale—being new, and provided with every appliance essential to first-class carbonization. Although it does not appear in the report, it may also be remarked that the oxygen used was manufactured at the Brin Company's own works, and sent to Westgate in cylinders, the quantity required for the purpose of the experiment being too small to make it worth while to erect special manufacturing plant upon the premises. It will be observed that Mr. Valon does not say anything upon the question of cost, for this reason. He has not made any oxygen himself; and cannot therefore state how much the gas will cost to produce upon the scale required for a large or moderate-sized gas works. All that he professes to do is to supply data for calculating the quantity of oxygen required to effect the object of complete and continuous purification of ordinary gas from sulphuretted hydrogen in oxide of iron purifiers of the usual description. From this any gas manager can compute for himself how much oxygen he would need for the daily use of his own works, and can find out from the Brin Company the terms upon which the necessary supply can be obtained. With this part of the question we have, of course, nothing to do. It is believed that oxygen may be made in a gas works for not very much more than the price of common coal gas. But this is a matter that requires to be proved, and will speedily be decided, if, as we expect, the published results of Mr. Valon's experiment lead him and other engineers to investigate the subject still further. The most salient point of Mr. Valon's statement on the subject is that, so far as he has gone, the use of oxygen is a valuable and desirable addition to the ordinary system of purification by oxide of iron, for the following clear reasons: The proportion of oxygen can be so precisely adjusted to the amount of sulphuretted hydrogen contained in the crude gas that when once an outside box is started it may be kept in use until it is absolutely saturated with sulphur, during which period not a trace of sulphuretted hydrogen or of superfluous oxygen need be found at the outlet of the purifier. The contents of the box will, therefore, never be touched until they are taken out for good."

Mr. Page, in explanation: Meaning from 65 to 70 per cent. of absolute sulphur, which is selling to-day in England at from $5 to $7.50 per ton. The oxide, just as it is taken out, is sent to the acid works, where they make sulphuric acid from it as if they were using pure brimstone—except that it is not used for making the commercial oil of vitriol. Continuing to read: "It is unnecessary to lay stress upon the meaning of this for the gas manager"—it means continuous purification until that box is closed to remove its contents, to charge with fresh material, and start the work of purification again. "Two oxide boxes will suffice for any works, since the purification is completely effected in one, and the labor and nuisance of revivifying are dispensed with altogether. This is what the oxygen process is capable of, according to Mr. Valon. Why, at this rate, not even the corporation of Manchester need send out foul gas any more. The superiority of oxygen over air for the continuous revivification of oxide appears to be proved by the statement that after the contents of a box had become too inert to revive with as much as two per cent. of air, a dose of oxygen brought it back to activity, and that under this treatment the oxide will continue to work until it has taken up 65 per cent. of sulphur. With regard to the proportion of oxygen required, it appears that 0.1 per cent. will neutralize as nearly as possible 100 grains of sulphur in the form of sulphuretted hydrogen in the crude gas. The computation is therefore easily made. The Westgate gas at the inlet of the purifiers contained from 566 to 618 grains of sulphur, having, it would appear, been desulphurized to a certain extent by the previous treatment. It therefore required 0.50 per cent. of oxygen, or perhaps a little more—certainly not exceeding 0.60 per cent.—to arrest the whole of the sulphuretted hydrogen in the first purifier. According to this statement, it must be a very foul gas that requires 1 per cent. of oxygen. The quantity is very small—only after the rate of 10,000 cubic feet per day for a make of a million. The next question is, of course, what would be the cost of making this 10,000 cubic feet of oxygen per day, and what would be the counterbalancing economy of labor and purifier room? In the case of works where purification cannot be carried on at all under the usual system, the oxygen process would naturally possess additional advantages which cannot be easily valued in money. Here we take the opportunity of correcting an earlier criticism of our own upon this process."

[I remember that very well. This paper does not take any thing for granted. They have a set of gas engineers who write just what they believe.]

"Writing of it before Mr. Valon took it in hand, we said, naturally enough, that the crucial question was whether it would pay to employ an agent like oxygen, which must cost something, to do work for which air, costing nothing, could be used equally well."

[That is a comparison as between Hawkins' system and this system.]

"The correction is with regard to the two latter words. It is the essence of Mr. Valon's report that pure oxygen will do its duty in an oxide purifier better than oxygen of the same amount diluted as air. The Brin Company are entitled to all they can find in the report in support of this conclusion. With regard to the effect of oxygen upon the illuminating power of the gas treated by the process, the evidence is at least calculated to remove apprehensions. The tests show a slight improvement in illuminating power when just sufficient oxygen is admitted to balance the sulphuretted hydrogen; but the difference is too small to be of any real money value. As compared with air containing an equivalent amount of oxygen, the pure gas shows a decided advantage, which is evidently due to the prejudicial effect of the nitrogen and carbonic acid of the air. It is a rather noteworthy result of these photometrical experiments that no difference was observable in the illuminating power of the gas whether the air or the oxygen was admitted into the hydraulic main or immediately at the exhauster inlet. It was thought that possibly by introducing the air or the oxygen into the hydraulic main it might become, to a certain extent, carburetted in its long passage in contact with the condensing tar; but this was found not to be the case. Curiously enough, however, neither air nor oxygen admitted at the hydraulic main was so efficient in revivifying oxide as the same when not subjected to the long contact with the tarry and ammoniacal vapors and liquids in a foul main, condensers, scrubbers, or washers. Why this should be so is not by any means clear. Finally, it should be borne in mind that this report, relating wholly as it does to oxide purification, does not shed any light upon the question of purification from sulphur compounds. Some of the sulphur in forms other than sulphuretted hydrogen, is doubtless arrested by the sulphurized contents of the purifier in this case; but it is not affected by the different methods adopted with a view to revivification. We are left in the dark as to the effect of oxygen if used in connection with Mr. McMinn's process of sulphur purification with simultaneous aeration of lime and oxide, which is an important branch of the subject. Altogether, therefore, although Mr. Valon's experiment is most valuable so far as it goes, it must be regarded as settling only the first and simplest case that might be presented in connection with the use of oxygen in the purification of gas by the dry way. Mr. Valon, or somebody else as careful and candid, must take up the question where it has now been left, and tell

us what oxygen is capable of in the more complicated developments of gas purification. This is the more necessary, because very few of the larger gas works, where the manufacture of oxygen on the premises could be regarded as practicable, can afford to look at the purification problem merely in the elementary way in which it was presented to Mr. Valon at Westgate. He never had so much as 27 grains of sulphur compounds per 100 cubic feet in his gas, and so the district did not suffer inconvenience from his deliberate neglect of the niceties of sulphur purification. What of places where the gas is sent out with over 40 grains of sulphur? Or what of the other places places where the Referees' limit must be observed? Possibly there may be an answer to these queries before long. In the meantime Brin's Oxygen Company are to be congratulated upon the improved position which their process must immediately occupy in the minds of gas engineers as a result of Mr. Valon's investigation."

Pardon me for having read so much of this, but it seems to me the most important matter, with regard to economy and freedom from danger, that can be presented to gas engineers is just this. Think of putting coal into the retort, and sending the gas out absolutely freed, as it will be, without any grain of sulphur in it, and as a plan for bringing in an added income per ton of coal carbonized. I believe, as I said to the New England Association of Gas Engineers, that five years from this day there will not be a purifier, as we know it now, in use in this country, unless it be found in a gas works in some out-of-the-way part of the country. I believe within 10 years that every foot of gas put into your holders will be at *nil*, that is, free from any cost; or because the residuals, many of them held formerly to be worthless, will have paid for both coal and labor. Therefore, the only tax remaining on you will be that for distribution.

On motion of Mr. Critchlow, a vote of thanks was tendered to Mr. Page.

The Secretary having read a dispatch from Mr. Funnell, of Albany, N. Y., thanking the Association for his election to honorary membership, Mr. J. M. Critchlow followed with his paper on

## FUEL GAS.

*Mr. President and Gentlemen*.—I have no apologies to offer in appearing before you upon a subject of such general interest, notwithstanding the fact that it has been carefully considered and presented to the fraternity by those, as yet, far in advance of the speaker, both in theoretical and practical knowledge of the same. My only claim for attention to-day is, that I am reluctantly before you, only after earnest and repeated demands from our worthy Secretary.

As our experience in manufacturing gas for fuel is necessarily limited—this art being as yet in its infancy—our Secretary must have expected me to say something new on the greatest of all fuel gases, Natural Gas, the accomplishments and popularity of which have done more toward awakening and developing the demand for the manufactured article than all else, and whose progress has caused us to multiply our experiments with systems and apparatus for the cheap and economic production of gas, whether from water, oil, coal, or other solid fuels. And our earnest wish is that they may go on and increase until, at a subsequent meeting of this Association, in the not distant future, some one will be hailed to the front with a description of the true Eureka furnace or apparatus which will economically distill all our solid fuel, that, with means employed to consume the same perfectly, it may be sold at a profit, and yet cheaper than the solid fuel. It takes faith; but I believe we shall see it before many years, I may say months hence.

There is perhaps little in reference to the utilization of natural gas that will be of interest to us here; and yet a large experience in handling natural gas for factory as well as domestic use, from the time, a few years since, when the same was obtained in great volume under rock pressure of 600 or 700 pounds per square inch, with corresponding producing or minute pressure of 400 to 450 pounds, till now, when the condition of the same fields may be approximated by dividing the above figures by two, has fully demonstrated the folly and extravagance of undertaking to vend any fuel gas to be consumed in the present crude manner. Especially is this true of our domestic fireplaces, as shown in the custom of heating a filling of refractory material in an open grate or fireplace, where from 75 per cent. of the heat goes up the chimney, or is absorbed by it and radiated outside of the house. The same quantity of gas, properly consumed in a good warm-air furnace in cellar, will heat four rooms more comfortably than one is heated in the fireplace style.

The utilization of natural gas has also solved, to a certain extent in advance, the question of pressure under which the gas can best be delivered to the fire, especially if the present Bunsen system of mixing the gas and air is continued. Many methods have been tried during the past four or five years, of mixing the gas with the proper amount of air for good consumption; and while I am not prepared to say that none is as good as the air mixer, the fact remains that probably four-fifths of the natural gas consumed to-day is consumed through the Bunsen air mixer. The pressure under which the gas is delivered will be dependent on the quality of the gas and the size of mains, whether proportionate to consumption.

In the distribution of natural gas for use under boilers, in furnaces, and for domestic purposes, various standards of pressure have been adopted by different engineers; but these all come within the extremes of 2 oz. and 16 oz. A very common cause of boasting by some has been that they were supplying under 2 oz. pressure; but my judgment has always been that it was an empty and barren accomplishment, and for this reason—it is difficult to get enough air mixed with the gas for good combustion. With 2 oz. pressure the gas passes lazily through ¾-inch bore in mixer, and has not velocity enough to draw the requisite amount of air to itself. Under such an increase of pressure that a ½-inch bore in mixer passes the same quantity of gas, better results are obtained. Moreover, it is economy to deliver the same quantity of gas through one mile of 6-inch pipe, under 16 oz. pressure, that would require a 9-inch line under 2 oz. pressure. Of course, with any manufactured fuel gas, the bore of mixer will be larger or smaller, according as the gas is poorer or better.

This brings us to a consideration of the gas to be manufactured largely for fuel purposes, and to be sold, not only as our Secretary has put it (at 50 cents per 1,000 cubic ft.), but for much less. I do not think the answering of the question, "How to make fuel gas that it may be sold for 50 cents per 1,000," is at all difficult; neither do I think that it will be at all satisfactory in helping to solve the fuel gas problem. There is probably not an engineer or superintendent present but knows that, with some present and well known systems of manufacturing either coal gas or carburetted water gas, a more profitable investment could scarcely be made than in the construction of a plant in any of our larger towns or cities for the distribution and sale of gas at 50 cents per 1,000, provided it was used generally, and, I may say, exclusively, for fuel, as natural gas is on streets piped with the same. It is also a fact known to us all that such gas can be put into holders at works throughout our State for from 20 to 25 cents per 1,000 easily, even with present appliances and apparatus. It is as well known that the cost at consumers' meters is seemingly greater than it should be, because of interest and wear and tear on an expensive system of pipage; necessarily large enough to deliver the make of the plant for 24 hours, all within a period perhaps averaging 6 hours. The same system of pipes under like pressure, leakage, care, expense, and superintendence, will probably deliver to the meters, for constant use as fuel, four times the volume of gas, as when used in distributing illuminating gas. With small works throughout the country to-day, selling illuminating gas on a sliding scale, from $1.50 down to 50 cents per 1,000, does any one question the correctness of the above? But the trouble is, gentlemen, that we cannot get the 50 cents per 1,000 for any gas to be used generally as fuel.

Careful experiments have proven conclusively that the figure is too high, and we must do much better on the same quality of gas before going on the market with the same. How can we do it? My answer must necessarily be along the line of my own experiments, and in keeping with a system and set of apparatus not yet made public. Said system and apparatus propose the combined manufacture of both coal gas and water gas, either blue or carburetted. For general distribution for domestic uses the mixture is of coal gas and blue water gas. For local use at manufacturing establishments, under batteries of boilers and in furnaces, the mixture is of coal gas and carburetted water gas, provided always that the increased demand for fuel oil does not render it out of the question; and it is the possibility, if not the probability of such a result that inclines me to the adoption of the more substantial and widely diffused base which we have in coal. My reason for combining the blue water gas for general distribution, and the carburetted water gas for local use is this. Under the system, and in the operation of the apparatus I have chosen to employ, it is thought best to utilize the producer gas from cupolas, which is ordinarily consumed to heat superheater filling, for distilling the coal gas. I am, on this account, unable to make a fixed gas from the oil that would not condense too much for general distribution, but which is equal to any for local or immediate use.

As you will note, I am of opinion that it will not pay, or be found economical, to pipe for general use a gas of diminished calorific value, like most producer gases. At the same time, where local establishments erect apparatus for their own use, and the cost of 200 or 300 feet of 20 or 24 inch pipe is, comparatively, a small matter, I believe it expedient to combine a percentage of producer gas.

Having answered the demand of our Secretary as well as my limited time and knowledge would permit, I close by submitting blue prints of apparatus to which I have referred.

*(To be continued.)*

## Result of the Petroleum Oil Fuel Tests at the Salem Pumping Station, Beverly, Mass., Oct., 1886.

In accordance with permission obtained from the honorable Water Board of the city of Salem, an elaborate and exhaustive test of the value of petroleum oil as fuel, when converted into and used as gaseous vapor, was made at this pumping station to ascertain:

First, the practicability of the use of such fuel; and,

Second, the commercial value of this gaseous fuel compared with good quality of hard anthracite coal for performing the work of a water supply.

In order that this report may convey complete information, it is necessary to describe the location of the station, the amount and character of the work performed, and the means provided for such work. The buildings are conveniently situated (within 80 or 100 feet of the lake from which the water supply is obtained), and contain the pumping machinery, also a suitable reservoir in the basement, into which the water from the lake flows by gravitation, from which the water is taken by the pumps and forced into a reservoir located at a distance of 1 1-4 miles, and at an elevation of 120 feet above the lake. The pumping machinery consists of duplicate pumping engines of the well-known duplex compound condensing pattern, Worthington & Co.'s manufacture, and rated as 6,000,000 gallons' daily (24 hours) capacity.

These engines are supplied with steam from boilers of the ordinary multi-tubular type. Two boilers are set in brick work in one battery, and a second pair of boilers set in a similar battery, distant from each other by some 20 feet.

Both batteries are connected by steam piping, and arranged to furnish steam either conjointly or separately to the pumping engines, and this pump is controlled by valves in such a manner that either one of the four boilers may furnish the necessary steam for operating either engine, as may be desired. At the time of the test the city of Salem and the town of Beverly were supplied with water for domestic and manufacturing purposes, requiring the duty of *one* pumping engine and two boilers, which was sufficient to furnish the (12 hours) supply, about 3,000,000 gallons.

The engine was operated at a pressure of 50 lb. per square inch above the atmosphere, and with open throttle, and adjusted to obtain 56 movements of the piston per minute, and pumping at each movement 80 gallons, against a constant water pressure of 60 lb. per square inch above the atmosphere, pumping 4,480 gallons per minute, 268,800 gallons per hour, 3,225,000 gallons in each 12 hours (the daily run).

Each boiler is 66 inches outside diameter, 18 feet in length, containing 94 tubes, 3 inches outside diameter and 14 feet in length.

The products of combustion traversed the entire length of the lower diameter of the shell, through the tubes to a smoke-box at the front end, passing over the steam space of the boiler to the stack.

To maintain a uniform boiler pressure of 50 lb. per square inch, the dampers operated by a careful employee, preventing a diminution or an increase of 1 lb. in either direction from the limit.

To obtain a comparative result of the use of the two fuels, it was determined to allow the battery of boilers usually employed in furnishing steam for the operation of the pumping engines to remain undisturbed during the test, bank the coal fires of *one* furnace, close the steam valves, and substitute the steam from *one* boiler using the gaseous fuel.

Under these conditions all trials of the gaseous fuels were made, and subjected the boiler operated with this fuel to losses in heat units due to their absorption by the brickwork of the second battery, of which this boiler formed a part.

The system of producing the gaseous fuel is now described; the application, results obtained, and the commercial value of such results when compared with coal, also on the commercial value of the results at the present time, due to a change in price of the coal and oil.

*Method of Producing the Gaseous Fuel.*—The oil for the purpose was ordinary petroleum of about 36 deg. gravity, stored in a suitable tank buried at a distance of some 50 feet from the boilers outside of the building. This tank was connected with a small (3×2×3) Worthington steam pump situated near the gas-making apparatus, which occupied a floor space 4 feet square and about 7 feet in height. The apparatus was located in the boiler room, convenient to the boiler furnished with the gaseous fuel.

The boiler using the gaseous fuel was fitted with a specially constructed furnace.

To manufacture the gaseous fuel the apparatus is connected with a source of steam supply (in this case from the two boilers in operation), and steam is introduced into the retorts at a reduced pressure of 15 lb. per square inch, by means of the ordinary pressure-reducing valve. In starting the apparatus oil in its raw state was employed as fuel to increase the temperature of the steam admitted to the retorts (to about 800 deg. Fahr.), and when this is obtained (about 30 minutes), oil from the tank is also forced into the retorts containing the steam, and a gaseous fuel is the result.

This fuel is used in the apparatus for superheating the steam, also introduced into the furnace, of special design, and so constructed as to afford the highest utilization of the units of heat. This fuel is easily controlled by ordinary valves, and the apparatus when once in operation continues to maintain itself until the oil is exhausted.

By a specially contrived arrangement of valves any oil unused returns to the tank.

Therefore, it only becomes necessary to adjust the water feed pump to obtain a regular water supply, and a valve to supply the amount of fuel sufficient to maintain a definite pressure. Fifty pounds steam pressure was required during the trial, and this pressure was fully maintained.

An important factor to be considered in the amount of *coal* used, and which has an important bearing is, that the entire mass of brickwork setting of the boiler using this fuel was surcharged with heat, preventing losses (due to the absorption of units of heat), which would have occurred had fresh fires been started

In other words, the boiler and its brickwork setting using coal were at a high temperature and in a fully expanded condition.

The total amount of coal used in 5 hours was 1785.5 lbs.

The gas apparatus was charged for all oil used from the time the oil was ignited in the furnace of the apparatus until the completion of the trial (5 hours).

In the use of one of the second battery boilers, an additional steam pump for water-feed was made necessary.

Therefore the steam from *one* boiler using coal and *one* boiler using gaseous fuel operated the pumping machinery, *two* water-feed pumps, the oil-supply pump, and supplied the necessary quantity for the apparatus manufacturing the gaseous fuel.

*Fuel Consumption.*

| | |
|---|---|
| Number of trials | 2 |
| Duration of each trial in hours | 5 |
| Average amount of oil burned in galls. (815 41-100 lb.) | 111.7 |
| Gases in flue, deg. Fahr | 400 |
| Average pressure in steam in lbs | 50 |

*Coal.*

| | |
|---|---|
| Number of trials | 2 |
| Duration of trial in hours | 5 |
| Total coal consumed (in lbs.) | 1787.5 |
| Gases in flue, Fahr., not taken | .. |
| Average pressure in steam in lbs | 50 |

*Fuel Comparison, Commercial Value.*
(October, 1886.)

| | |
|---|---|
| Duration of trials, hours | 5 |
| Coal (at $5.25 per ton), 1787.5 lb | $4.69 |
| Oil (at .04 per gallon, 111.7 galls) | 4.46 |
| Difference in favor of oil in 5 hours | $0.23 |

*Change in Cost of Oil and Coal.*
(March, 1888.)

| | |
|---|---|
| Duration of trials in hours | 5 |
| Coal at $6 per ton (1787.5 lb.) | $5.36 |
| Oil at .03 per gallon (111.7 galls) | 3.35 |
| Difference in favor of oil in 5 hours | $2.01 |
| Coal (Oct. 1887) $5.25 per ton (1787.5 lbs.) | 4.69 |
| Oil (March, 1888) .03 per gallon (111.7 galls.) | 3.35 |
| Difference in favor of oil in 5 hours | $1.34 |

*Conclusions.*—From the foregoing it is determined that the proposition as to a *practical use* of a gaseous form of fuel from crude petroleum is fully met; and that the second proposition as to the *commercial* value of gaseous fuel with good quality of anthracite coal is fully demonstrated, when compared with the disadvantages present at the time of the trial. Under more favorable conditions the cost of the oil fuel results would have (Oct., 1887) been more satisfactory.

The change in cost of the two fuels makes a large saving possible, and would amount to a considerable sum yearly.

Coal costing $5.25 per ton, and oil 3c per gallon, delivered at the station, the amount of saving would be $1,003.39.

The contingent advantages, such as the entire absence of ashes, clinkers, smoke, dirt, and cost of handling the solid fuel; the advantage of a uniform pressure of steam, with less labor for operation, were not considered.

The entire arrangement being exceedingly simple in construction, easily maintained, perfectly safe in operation, noiseless and odorless, there is no reason why gaseous fuel obtained from crude petroleum should not be acceptable to the user, when the relative cost of the two fuels will permit of its introduction.

These tests were conducted by Joseph G. Dennett, Chief Engineer of the Station; Charles E. Aschcroft, Mechanical Engineer; J. Comer Jones, Washington, D. C.

THE AMERICAN
GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

Editor—JOS. R. THOMAS, C.E.
Asst. Editor—T. J. CUNNINGHAM.
Manager—C. E. SANDERSON.

PUBLISHED ON THE 2ND AND 16TH OF EACH MONTH
At No. 42 Pine Street, New York.

This is a recognized official organ of—
LIGHT, HEAT, STEAM, WATER-SUPPLY,
VENTILATION, SANITARY IMPROVEMENT
AND GENERAL SCIENCE.

TERMS:
SUBSCRIPTION—Three Dollars per annum, in advance.

MONDAY, APRIL 16, 1888.

## The Market for Gas Securities.

That proposed emission by the Consolidated Company of 3 millions of bonds, scrip, or what not, has been widely discussed within the fortnight; and the only conclusion we can make in regard thereto, at least as far as this column is concerned, is that no one outside of the executive management can really say for what the indebtedness is to be incurred. One "financier," who is a holder of over 300 shares in the Company, seemed to favor the idea that the millions were to be devoted to the purpose of eventually representing in capital account the payments within the last year or so on plant betterment. When asked why such a proposition should drive the stock down 7 or 8 points, the "financier" failed to make further elucidation of his bright dreams. The stock has recovered somewhat from the extreme depression of a fortnight ago, having sold up to 72 but is now hanging fire in the neighborhood of 70½ to 71. We still believe that the next dividend rate will be one-half per cent. better than the last, although our opinion, candor compels us to add, rests on a very fragile foundation. The rate war rumors are still heard in the town, but not much stress need be placed thereon. Equitable is weak and lower, the shares being freely offered at 110. Some days ago the *Tribune* published the following item: "A deed was filed by which the entire property of the Standard Gas Light Company will become vested in Jabez A. Bostwick on its failure at any time hereafter to meet its notes with interest given to Bostwick for sums aggregating $401,000." Oh! Brooklyn shares are in better demand, at higher prices. Among recent auction sales we note the following: $3000 Williamsburgh bonds, at 111¼; $500 old Metropolitan Company's 6 per cent. bonds, due 1910, at 115; 294 shares Jersey City gas, at 166¾–167½; 200 shares Peoples, Jersey City, at 60½–60¼. Considerable activity is reported in out-of-town shares. On March 31, on local exchange, 375 shares Montreal (Can.) gas were sold at 210¾–¾–211, ex-div. of 6 per cent. On same date 1 share Boston gas sold at 200½, 1 other share being disposed of on April 5, at 200. Cambridge (Mass.) gas was sold to the extent of 13 shares, at 170½–169½. The Newark and Citizens Companies (Newark, N. J.) have declared their usual quarterly dividends of 2½ and 2 per cent. respectively. Baltimore shares are fluttering betwixt despair and hope on alternate rumors in favor of and against consolidation. It is probable, now that the Baltimore Equitable has been forced to the wall, consolidation will be arranged for this summer. Cincinnati gas is at 179½, and Memphis gas is bid for at 45. South Side, Pittsburgh stock is offered at 152, and Washington gas hugs the 200 mark.

## Gas Stocks.

**Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks.**

16 WALL ST. NEW YORK CITY.

APRIL 16.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share. ☜

| | Capital. | Par. | Bid | Asked |
|---|---|---|---|---|
| Consolidated | $35,430,000 | 100 | 70 | — |
| Central | 440,000 | 50 | 30 | — |
| " Scrip | 220,000 | — | 47 | 57 |
| Equitable | 3,000,000 | 100 | 105 | 110 |
| " Bonds | 1,000,000 | — | 113 | 115 |
| Harlem, Bonds | 170,000 | — | — | — |
| Metropolitan, Bonds | 658,000 | — | 115 | 118 |
| Mutual | 3,500,000 | 100 | 90 | 92 |
| " Bonds | 1,500,000 | 1000 | 101 | — |
| Municipal, Bonds | 750,000 | | — | — |
| Northern | 125,000 | 50 | 30 | — |
| " Scrip | 108,000 | | | |
| Yonkers | | 50 | — | 80 |
| Richmond Co., S. I. | 300,000 | 50 | 55 | 60 |
| " Bonds | 12,000 | — | — | — |
| Gas Co's of Brooklyn. | | | | |
| Brooklyn | 2,000,000 | 25 | 102 | 104 |
| Citizens | 1,200,000 | 20 | 52 | 54 |
| " S. F. Bonds | 320,000 | 1000 | — | 103 |
| Fulton Municipal | 3,000,000 | 100 | 131 | 133 |
| " Bonds | 300,000 | | — | 106 |
| Peoples | 1,000,000 | 10 | 69 | 72 |
| " Bonds (5's) | 368,000 | — | 97 | — |
| " " (6's) | 94,000 | — | 100 | — |
| Metropolitan | 1,000,000 | 100 | 75 | 80 |
| Nassau | 1,000,000 | 25 | 100 | 105 |
| " Ctfs | 700,000 | 1000 | 98 | 100 |
| Williamsburgh | 1,000,000 | 50 | 120 | 125 |
| " Bonds | 1,000,000 | — | 111 | — |
| Out of Town Gas Companies. | | | | |
| Boston (Mass.) Gas Co | 2,500,000 | 500 | 200 | — |
| Buffalo Mutual, N. Y. | 750,000 | 100 | 90 | 95 |
| " Bonds | 200,000 | 1000 | 95 | 100 |
| Citizens, Newark | 1,000,000 | 50 | 140 | 145 |
| " " Bonds | 45,000 | — | — | — |
| Chicago Gas Trust | 25,000,000 | 100 | 34 | 35 |
| Cincinnati G. & C. Co. | 6,000,000 | 100 | 179 | 180 |
| Chesapeake, Balt | 1,000,000 | 100 | 88 | — |
| " | 1,000,000 | | 100 | 102 |
| Consumers Toronto | 1,000,000 | 50 | 192 | — |
| Central, S. F., Cal | | | — | 84 |
| Capital, Sacramento, Cal. | | | 57 | 60 |
| Consolidated, Balt | 6,000,000 | 100 | 55 | — |
| " Bonds | 3,600,000 | | 107 | 107½ |
| Hartford, Conn | 750,000 | 25 | — | 138 |
| Jersey City | 750,000 | 20 | 165 | 170 |
| Laclede, St. Louis, Mo. | 2,000,000 | 100 | 118 | 120 |
| Louisville, Ky | 2,570,000 | 50 | 108 | 114 |
| Little Falls, N. Y. | 50,000 | 100 | 95 | 100 |
| " Bonds | 25,000 | — | 100 | 103 |
| Montreal, Canada | 2,000,000 | 100 | 212 | 215 |
| Memphis (Tenn.) Gas | 750,000 | 100 | 45 | — |
| " Bonds | 240,000 | 100 | 103 | — |
| New Haven, Conn | | 25 | 193 | 197 |
| Oakland, Cal | | | 33 | 34 |
| Peoples, Jersey City | | — | 60 | 61 |
| " " Bonds | | | — | — |
| Paterson, N. J. | | 25 | 90 | — |
| Rochester, N. Y. | | 50 | 75 | 80 |
| Syracuse, N. Y. | 500,000 | 25 | 115 | — |
| St. Louis, Missouri | 600,000 | 50 | — | — |
| San Francisco Gas Co. | | | | |
| San Francisco, Cal. | 10,000,000 | 100 | 57 | 58 |

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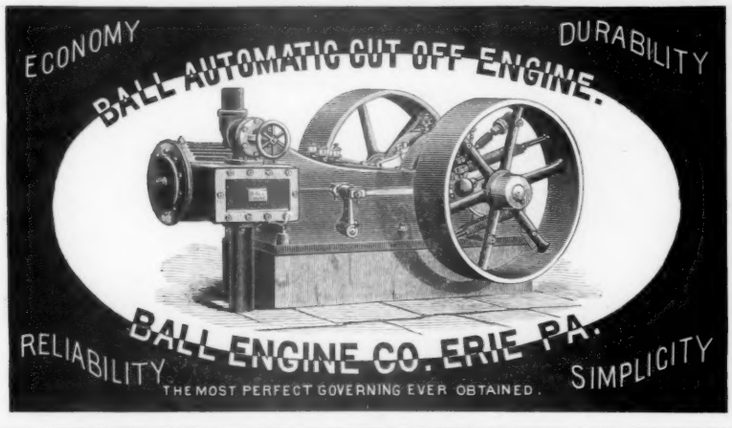


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JOHN H. McELROY, Engineer.

ALLEGHENY, PA., Sept. 24, 1887.

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ROBT. YOUNG, Eng. and Supt.

OFFICE COLUMBUS GAS LT. AND COKE CO., COLUMBUS, OHIO, October 14, 1887.

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Yours truly, E. McMILLIN, V. P. & Gen. Mangr.

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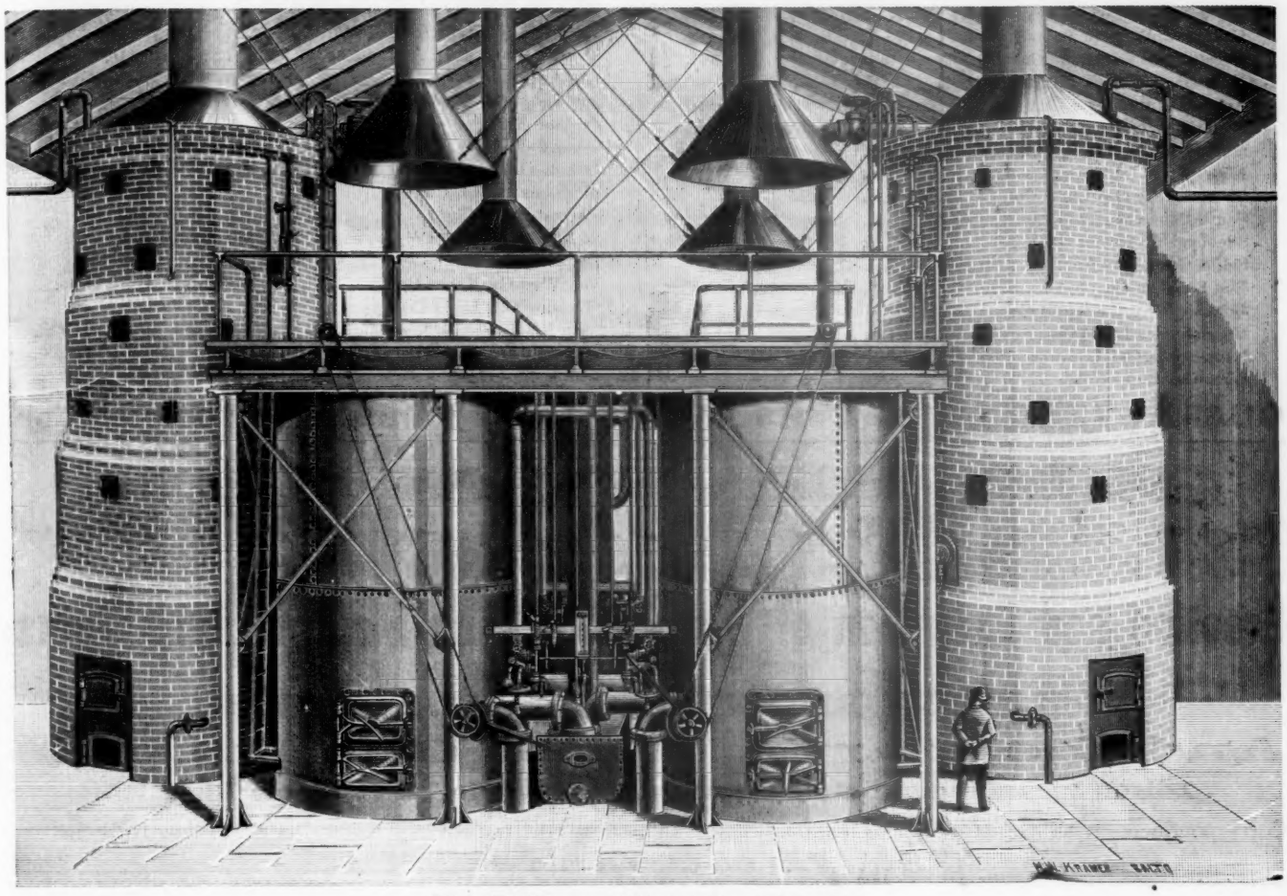

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| C. R. I. & P. R. R. Shops | Chicago, Ill. |
| Decatur Gas Light and Coke Co. | Decatur, Ill. |
| Niles Gas Light Co. | Niles, Mich. |
| Newton Illuminating Co. | Newton, Kansas. |
| Wellington Light and Heat Co. | Wellington, Kansas. |
| Chippewa Falls Gas Light Co. | Chippewa Falls, Wis. |
| Elkhart Gas Light and Coke Co. | Elkhart, Ind. |
| Madison City Gas Light Co. | Madison, Wis. |
| South Bend Gas Light Co. | South Bend, Ind. |
| Sheboygan National Gas Co. | Sheboygan, Wis. |
| Salina Gas Light Co. | Salina, Kansas. |
| The Rathbun Co. | Deseronto, Prov. Ont. |
| Jefferson City Gas Light Co. | Jefferson City, Mo. |
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| Minneapolis Gas Light and Coke Co. | Minneapolis, Minn. |
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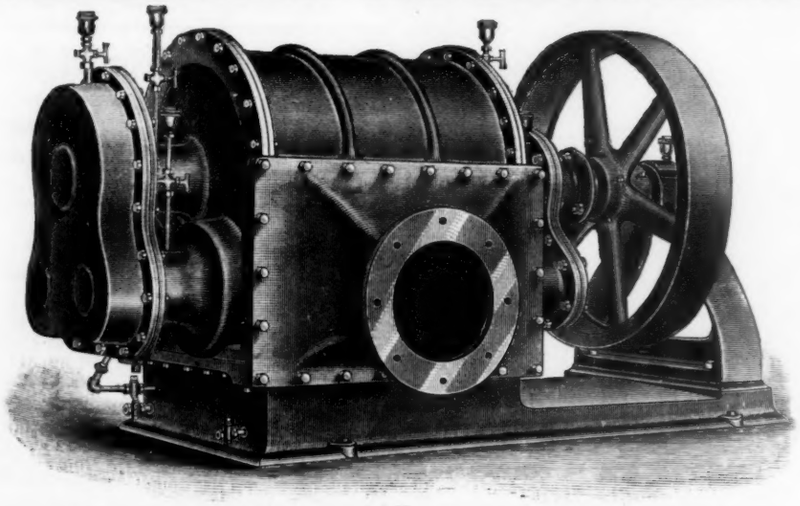

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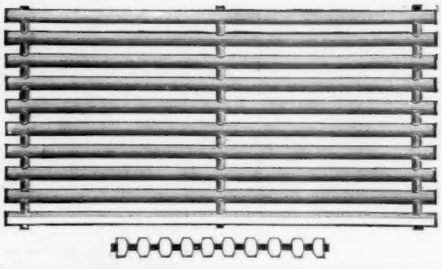

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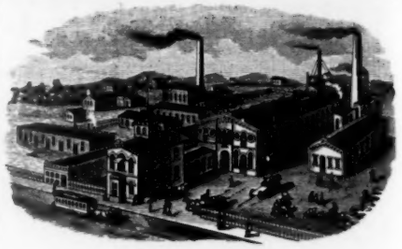

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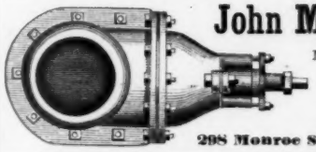

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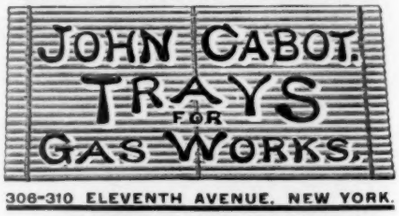


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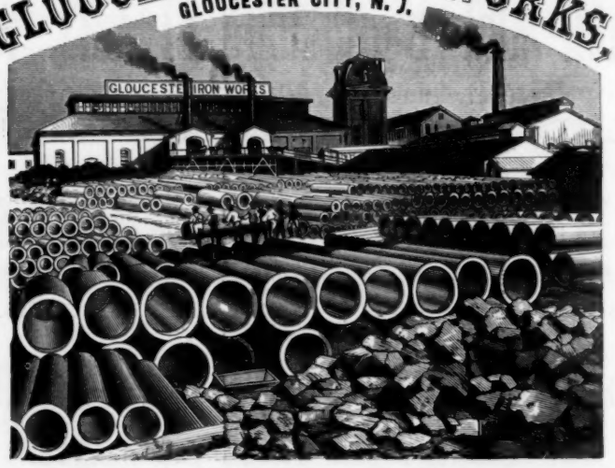


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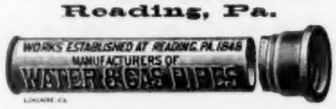


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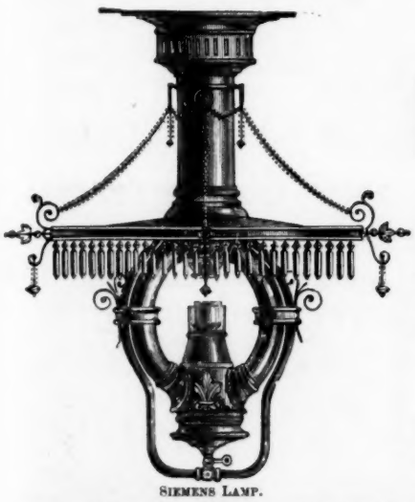

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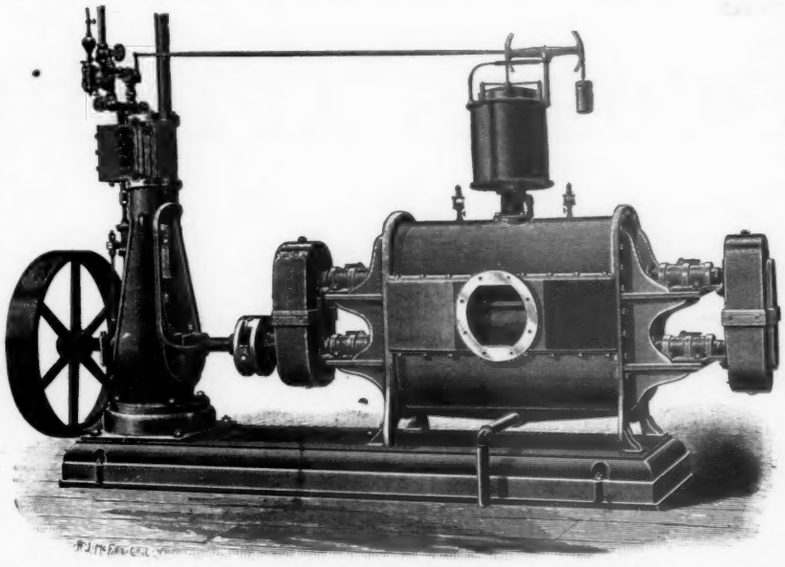

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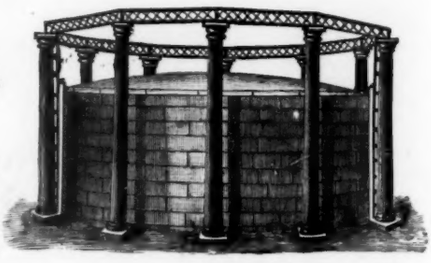

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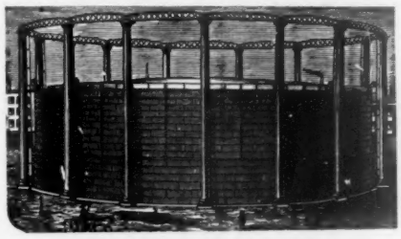

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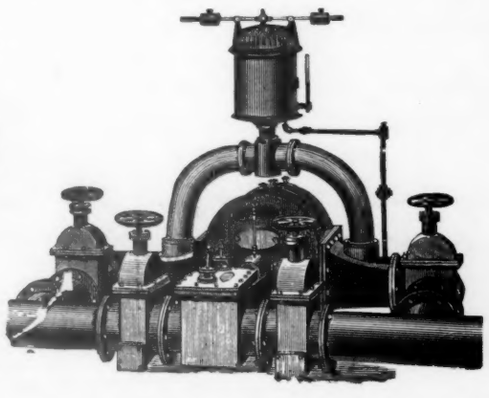

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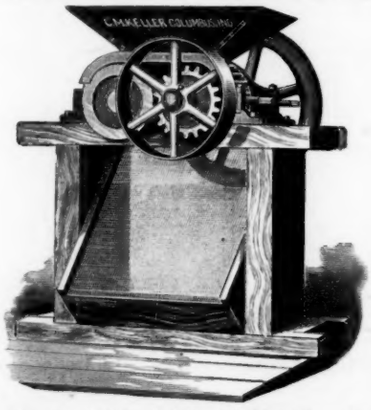


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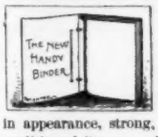


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